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ABSTRACT

The curriculum guide for the Academic Language and Literacy Training Project (ALLT) developed at Georgia State University is presented in this report. ALLT was a federally-funded training project designed to improve and extend the specialized training of Georgia teachers of limited-English-proficient students in the core curriculum areas of mathematics and science. The project provided teachers with a curriculum integrating academic language, literacy, critical thinking, and problem-solving skills for LEP students with math and science content. Project products included a teacher development curriculum (presented here), videotape and guide, model lesson plans, and final report. The curriculum is designed for either on-site or distance learning, and consists of 12 sessions. Materials provided for each session include a list of general purposes, language objectives and needed materials, introductory notes, suggested general class activities, and lists of objectives, materials, and activities for mathematics and science content. Some worksheets are also included with each session outline. An outline of the site facilitator's role is appended. Contains 34 references and a bibliography of 19 project-related publications. (MSE)

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ED 406 834

The Academic Language and Literacy Training Project.

Mathematics & Science for English Learners:

Curriculum

Center for the Study of Adult Literacy

Georgia State University
Atlanta, Georgia

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The Academic Language
and
Literacy Training Project.

Mathematics & Science
for English Learners:

Curriculum

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Introduction

The Academic Language and Literacy Training Project (ALLT) for teachers of mathematics and science with Limited English Proficient (LEP) students was a training project funded for four years[1] by a grant from the U.S. Department of Education, Office of Bilingual Education and Minority Language Affairs, Title VII, Educational Personnel Training Program, Mathematics/Science Priority. The project was cooperatively developed by personnel from the Center for the Study of Adult Literacy, Georgia State University; the Boards of Education from Cobb, Clayton, DeKalb, Fulton, and Gwinnett Counties; and the Bilingual/Migrant Education Office of the Georgia Department of Education. It was designed to meet the need to improve and extend the specialized training of Georgia teachers responsible for instruction of LEP students in the core curriculum areas of mathematics and science. Participants in the project included: 1) English to Speakers of Other Languages (ESOL) teachers who had obtained the bilingual/ESOL certification endorsement but who had very little specialized work in mathematics and science instruction and 2) regular classroom teachers who taught mathematics and science to LEP students but who did not have the bilingual/ESOL certification endorsement. The project provided these teachers with an ESOL mathematics and science instruction course that integrated academic language and literacy, critical thinking, and problem-solving skills for LEP students with current mathematics and science curricula. Products of the project include a curriculum, video and video guide, model lesson plans, and final report. (See Appendix A for a list of these publications.)

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[1] The funding was not available for Year 4 due to federal budget cuts.

The ALLT Project was designed to meet four broad objectives:

1. Develop an ESOL mathematics and science instruction staff development course that integrates academic language and literacy with current mathematics and science curricula, including critical thinking and problem-solving skills.
2. Prepare teams of ESOL and regular classroom teachers to improve and extend their academic language and literacy instruction for LEP students in the core curriculum areas of mathematics and science by a) offering instruction leading to Staff Development Units (SDU's) and an ESOL Mathematics and Science certificate that meet state and local requirements for current certificate renewal and b) encouraging participants to enroll in university ESOL certificate endorsement courses or other advanced courses in mathematics/science.
3. Prepare teams of ESOL and regular classroom teachers to adapt their classroom environment, materials, and interaction patterns to increase the participation of LEP students in mathematics and science classes.
4. Develop a package of training materials that can be used to improve academic language and literacy instruction in the core curriculum areas of mathematics and science for LEP students at all grade levels throughout the state of Georgia.

The "Teaching Mathematics and Science to English Learners" course was organized for both ESOL and K-12 classroom teachers of mathematics and science to LEP students. Specific topics planned for content-based language instruction to meet the needs of these teachers are listed in the course syllabus at the beginning of the *Curriculum*. The course was scheduled for twelve four-hour sessions spread over either a semester or the academic year each of the three project years. For the first two project years, classes were held in a centrally-located school in each system served. During the third project year, in-school sessions were combined with sessions delivered using the Georgia Statewide Academic and Medical System (GSAMS) distance learning format. In the sessions using the GSAMS technology, participants at sites in three different school systems were linked with instructors at the host site. Had Year 4 been implemented, it would have used GSAMS to link teachers state-wide. The project course sessions were taught by three instructors who shared responsibility for portions devoted to mathematics, science, or ESOL methodology. Course content was delivered on an occasional basis by guest speakers and graduates of the course from previous years.

Guidelines for Use

The curriculum for the staff development course can be used either with a traditional on-site training format or in a distance learning format using a distance learning system (e.g. GSAMS). The *Curriculum* (see Figure 1) is designed for twelve sessions needed for a 5 SDU course; however, individual sessions or groups of them could be used to meet particular system needs. The outline is organized in a standard structure with goals, materials, activities, and closure (assessment) for the segments of each session devoted to language, mathematics, and science. Materials lists and activities should be previewed before the start of the course as some sessions require advance collection and/or preparation of materials by course instructors or participants. The materials suggested are designed to increase active participation of the course participants and are readily available in most school settings.

Single School Format

A copy of the video and *Video Guide* may be checked out from the Bilingual/Minority Education Office of the Georgia State Department of Education. In addition to this *Curriculum*,

Figure 1

TEACHING MATHEMATICS AND SCIENCE TO ENGLISH LEARNERS STAFF DEVELOPMENT COURSE SYLLABUS

Course Description

This course is designed as a component of ALLT, a Title VII Educational Personnel Training for ESOL and K-12 classroom teachers of mathematics and/or science to LEP students. Course activities will focus on "hands-on" strategies to help LEP students develop comprehension, problem-solving, experimentation, and communication skills required for success in mathematics and science.

Course Objectives

Through group activities, course participants will demonstrate:

1. familiarity with characteristics of LEP students that impact on their performance in mathematics and science;

2. knowledge of materials and techniques that integrate teaching language and literacy with mathematics and science;

3. ability to select and adapt current mathematics and science curricula to help LEP students develop academic language and literacy, critical thinking, and problem-solving skills;

4. ability to adapt their classroom environment, materials, and interaction patterns to increase the participation of LEP students in mathematics and science classes.

Credit Hours

The class will meet for 50 contact hours and will require some additional time in outside reading and planning. Any missed classes or assignments will require the completion of makeup work. Participants will be eligible to earn five (5) SDU's.

Instructors

There will be a team of instructors in language, mathematics, and science, and other guest speakers.

Course Requirements

Each course participant will:
1. Lead and participate in discussion and activity groups.
2. Plan and implement mathematics and/or science instruction adapted for LEP students.
3. Read and respond to assigned handout materials.

TEACHING MATHEMATICS AND SCIENCE TO ENGLISH LEARNERS
STAFF DEVELOPMENT COURSE SCHEDULE & TOPICS

Session 1	Course overview LEP student characteristics Mathematics and science curricula
Session 2	Content-based instruction for LEP students Language and problem solving in mathematics and science Second language acquisition processes
Session 3	Comprehensible input Cognitive language and problem solving in mathematics and science
Session 4	Adapting instruction for mathematics and science
Session 5	Activating and developing background knowledge Using academic print and graphics for problem solving and experimenting in mathematics and science
Session 6	Linking new concepts with prior knowledge Experimentally-based instruction
Session 7	Strategies for comprehending mathematics and science instructional materials
Session 8	Investigating, experimenting, and reporting in collaborative student groups in mathematics and science
Session 9	Assessing LEP students' performance in mathematics and science activities
Session 10	Using multi-sensory materials and instructional techniques for mathematics and science reasoning
Session 11	Using language and literacy skills to express new concepts and relationships in mathematics and science
Session 12	Sharing instructional adaptations and planning strategies

they will serve as a guide and resource to course instructors selected by local systems. Qualified instructors might be found in teachers with experience in ESOL methods, preferably with a focus on content-based instruction. System personnel with experience teaching mathematics and/or science to diverse student populations would also be good candidates.

Distance Learning Format

The GSAMS distance learning technology gives school systems a new alternative for coordinating training activities with other interested sites. This system technically allows up to seven sites to receive and transmit information with each other using two-way interactive audio and video connections. The course sessions are designed so that one site with the course instructor(s) can be used as the host site with other sites acting as receiving sites led by a site facilitator.[2] Distance learning is especially useful when small groups of participants in geographically scattered locations have similar needs. The technology gives the benefit of the expertise of the course instructor(s) at one location to many participants without requiring either instructor or participants to travel long distances.

A number of decisions must be made if the distance learning format is used. The host site may remain the same throughout the course, with other sites as consistent receiving sites, or the host site (with "live" instruction) can be rotated across all or several of the sites as the course progresses. The number of sites that can be effectively taught using this format depends partly on the amount of interaction, personal contact, and instructor guidance needed by the participants. All sites receive the audio transmission on a continuous basis; however, participants must speak one at a time to be understood clearly with all other sites in a "receiving" mode. Thus there is some constraint on the number of sites and group sizes based on the amount of wait-time participants at any one site consider acceptable as other sites respond. Video transmission from the remote sites is triggered by the audio portion of the system. Thus at any given time, each site receives the video transmission from two sites, i.e. the host site and whichever of the remote sites has most recently responded verbally. This means that the instructor(s) at the host site communicate directly with one of the remote sites at a time, another factor in considering the total number of remote sites feasible for effective instruction.

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[2] Please see Appendix B for a description of the site facilitator's role in this specific course.

Procedures for using the GSAMS system vary according to the school system. In order to offer the course using the GSAMS system, you should begin with the following general steps and then follow the guidelines of the systems with which you plan to work.

1. Check on the availability of a GSAMS site within your system with the central office of your local Board of Education. Often these sites are located in high schools or middle schools, with the media specialist or principal as the Site Coordinator.

2. The Site Coordinator can give you information about local policies for a) making connections among individual GSAMS sites, b) reserving and scheduling sites and site facilitators for planned sessions, and c) charges for connection to the system and required facilitator and custodial/security services.

3. The Site Coordinator can also supply you with general requirements for site facilitators in your system.

Additional information about the GSAMS system is available from several sources. Assistance with setting up a cluster of GSAMS sites for training is available from Donna Ferguson, Site Coordinator for Distance Learning at Georgia State University, (404) 651-2370. Short-term training for presenters new to the distance learning format is also available through Georgia State University;

for information, contact Don Howell at (404) 651-3334. General information on the GSAMS system and what it can do is also available; for information contact Lisa Ciardulli, GSAMS training facilitator, (770) 423-6574.

Meeting Teacher Needs

Activities in the *Curriculum* were used with diverse participant groups who represented a variety of background experiences, teaching styles, primary teaching responsibilities, and LEP student populations served. The following recommendations from the project implementation can be used to adapt the *Curriculum* to fit the needs of particular participant groups.

1. Student grade level. If the group is composed of teachers from different grade levels, these levels can be used to form small groups as they are recommended in the activity descriptions. Groups may also be composed of teacher teams from the same school, or teachers with students of similar language and/or content proficiency. Most of the activities are open-ended to a degree that will encourage student participation at many different levels of skill and intensity. Participants may discuss after demonstrations or hands-on activities the different ways students might be involved in the activity. If GSAMS is used, grade level groups could alternately be given an assigned activity to complete off-screen while the rest of the group is directly engaged by the instructor on-line.

2. Primary teaching responsibilities. During some activities, teachers with similar teaching responsibilities (mathematics, science, ESOL, or elementary, middle, secondary) may be grouped to share ideas. At other times, pairing teachers with different teaching responsibilities in either the same or different schools can encourage participants to share and learn from the varied perspectives of these different roles. This sharing of cross-curricular concerns can be especially useful in situations when there are limitations on the opportunities that teachers have to communicate within the regular

school schedule, e.g. if many ESOL teachers are itinerant and serve several schools daily or weekly.

3. Teacher experience. The *Curriculum* is designed to offer adaptations to make basic mathematics and science concepts more comprehensible, accessible, and participatory for students learning English as an additional language. The activities are multi-level, cooperative, experience-based, authentic, flexibly organized, and integrated to encourage teachers as well as students to participate actively and comfortably with a range of concepts and processes. These features should help teachers involve students in different levels of content knowledge and process mastery. Experienced teachers may also use the suggested techniques to instruct in other content areas. Those teachers with less expertise in current methods of teaching mathematics, science, or ESOL may need more information from the resources recommended in the lesson plans.

Session 1

COURSE OVERVIEW

Purpose

- Become acquainted with other participants, instructors, and course objectives.
- Share experiences, interests, and needs in teaching ESOL students.
- Identify difficulties ESOL students have with content area instruction.
- Identify characteristics of current mathematics and science curricula.

LANGUAGE

Objectives

- Increase sensitivity to language demands of mathematics and science instruction.
- Identify language proficiency required by simple problem-solving tasks.

Materials

- "Course syllabus"
- "The ALLT Mathematics and Instruction Survey" **(S1/L1)**[3]
- Name tags
- Markers
- Blank paper
- "Science and Mathematics Processes" **(S1/L2)** handout

Introduction

- Welcome all participants to the course. Distribute the course syllabus **(See Figure 1)** and review course objectives, activities, and requirements. If necessary, have participants fill out forms for SDU's credit.
- Have participants complete the "Initial Course Survey" **(S1/L1)**.
- Elicit from the participants some of the challenges ESOL students face in their classrooms. Discuss mental processes required for successful performance in science and mathematics, emphasizing demands on language fluency.

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[3] Labels for handouts are as follows **S** = Session, **L** = Language, **M** = Mathematics, **Sc** = Science. The number after each letter refers to a) the session and b) the order in which the instructor of each segment of a particular session used the handouts. All handouts, with the exception of the "Course Syllabus" which precedes **Session 1**, follow the session at which they are used.

- Emphasize the benefits to ESOL students of having content area (mathematics and science) teachers and ESOL teachers working together to coordinate instruction.
- Distribute the "Mathematics and Science Processes" **(S1/L2)** handout. Ask participants to be aware of when and how they use these processes throughout the activities of this and subsequent sessions.

Activities

- Quote Dennis the Menace: "The trouble with learning is it's always about something you don't know." Discuss how this quote applies to ESOL students who must not only master new content area concepts and vocabulary, but also the basic interpersonal and instructional language proficiency that teachers may assume students already know.
- Distribute large name tags (or 3x5 index cards) and markers to participants for introductory name activities that encourage participation with very low language requirements and therefore less risk for reluctant students. Tell participants to write or draw the following information about themselves on the tag:

  Middle -- name
  Upper left -- birthplace
  Upper right -- favorite in-school activity
  Lower left -- favorite out-of-school activity
  Lower right -- something you're looking forward to

  Other data can be substituted for the corners.

- Participants can share information with others at their table as they finish.
- When everyone has finished, direct participants to move to locations in the room (corners, sides) based on the data on their tags, then share and compare data with at least one other person in that location. Sample directions: birthplace inside/outside the U.S., east/west of the Mississippi River, inside/outside of Georgia; birthplace that you would reach by car/plane/boat; in-school activity before/after lunch; out-of-school activity done alone/with partner/in a group. Ask if another decision could have been made, e.g. some locations could be reached by several modes of transportation. Share data with the whole group.
- Discuss how this activity could be used with ESOL students. List ideas of how the participants could succeed in moving to the correct location; this is especially important for students still in the silent period. Receptive language skills that precede and exceed expressive skills should be used by all students. More proficient students can share data with partners (low risk) and/or with the group as a whole. Students can hear models of the decision-making process.
- Discuss how problem-solving processes associated with the academic content areas of mathematics and science can also be used in typical daily activities. Raise awareness of the potential of these activities for language and literacy development with ESOL students.

MATHEMATICS

Objectives

- Get acquainted with participants' background and experience in the teaching of mathematics.
- Enrich existing vocabulary with technical vocabulary associated with mathematical concepts.

Materials

- "Square One: Getting to Know You" (**S1/M1**, parts 1 and 2) questionnaire
- Dollar bills (one for each participant pair)
- Latest published material on currency(ies) available at the Federal Reserve Bank in Atlanta
- "Mathematics and Science Processes" (**S1/L2**)

Introduction

- Discuss the cross-discipline approaches that hands-on activities support.
- Suggest the possible contexts in mathematics in which this approach would be valuable.

Activities

- Have participants complete the "Square One..." (**S1/M1**, parts 1 and 2) questionnaire.
- Put participants in pairs. Give each pair a $1 bill. Ask them to talk with each other about anything they find interesting on the bill.
- As needed to stimulate close observation and continued discussion, draw attention to particular illustrations, graphics, patterns, numerals, etc. that express mathematical concepts.
- Invite sharing of the findings. These can be recorded on a central list that can then be divided into different categories or used to develop a semantic map.
- As participants report their findings, attach mathematical terminology to relevant concepts (e.g. symmetry, right angles, perimeter).
- Identify the range of mathematics and science processes (**S1/L2**) that were used during this activity to facilitate communication in group settings. This activity is an example of the rich language possibilities that can be created with simple or common place materials. Such close examination of an everyday object may transfer to closer attention to other common objects often ignored or only fleetingly considered.
- Discuss how this experience with an everyday object can be used as an introduction to cross-discipline studies. Brainstorm a list of possible next activities stimulated by these partner interactions with concrete materials that would be useful to those ESOL students ready to study more abstract concepts (e.g. money, economics, banking, currency systems).

SCIENCE

Objectives

- Highlight key elements for successful communication with students.
- Plan environments that foster student self monitoring of cognitive demands of given tasks.

Materials

- Construction paper shapes (square, triangle, pentagon, circle, etc.) to be hung on participants' backs. The number of different shapes as well as the number of pieces of each shape depends on the size of the participant group. There should be 2-3 pieces with the same shape and color for each group. For instance, a group of 20 participants might be divided into 3 blue squares, 2 green squares, 3 red triangles, 2 blue triangles, 3 green circles, 2 brown circles, 3 brown rectangles, and 2 red rectangles.
- String

Introduction

- As participants enter the room, put a shape on their back (construction paper with yarn taped in a loop large enough to fit around the neck is a simple means). Tell each participant not to look at their shape nor to tell anyone about theirs.

Activities

- After general introductions, tell participants they are going to pretend to be language limited. They must discern what color and shape is on their back by asking one-word questions. They may only ask one question per person. When asked a question by another participant, they may only respond with a "yes" or "no." Once they figure out what color and shape they have, they must find the other participants whose shape matches theirs and form a group with them. They must then discuss the difficulties they encountered. How was this experience similar/different from what an ESOL student might experience in an all-English classroom setting in which scientific problem solving is taught?
- Discuss the current shift from treating the curriculum as an accumulation of facts to be memorized to a fluid body of knowledge. Stress the effects of this on the teaching of science, mathematics, and language, highlighting the emphasis due to important concepts, processes, and connections among disciplines[4].
- Make an analogy between the building of science/mathematics literacy and the building of a house. In this analogy the house foundation is the equivalent of cognitive processes (e.g., observing, communicating, comparing, ordering & categorizing, relating, inferring, applying).

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[4] Science Framework for California Public Schools. (1989). Sacramento, CA: California State Board of Education.

Compare the framing of the house to the themes, unifying constructs, or recurring ideas that provide context to explain facts and events. These logical ways to organize science or mathematics include systems / interactions, stability, energy, patterns of change, action / reaction, and diversity / unity. The stones that fit within the framing are the equivalent of concepts, facts, and theories. To complete the analogy, compare the mortar and nails that are needed to hold the rest of the components together to the students' enjoyment and curiosity.

CLOSURE[5]

Have participants make a joint list of similar and different experiences among themselves (e.g. number of ESOL students, nationality of such students, subject taught, and etc.).

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[5] Closure activities provide a process assessment of the purpose(s) for each session. For distance learning, **Closure** activities may have to be adapted depending on the needs of the participants and the number of sites and participants. It may be more effective to conduct all such activities individually for each site.

R. Hough
August, 1993

THE ACADEMIC LANGUAGE & LITERACY TRAINING PROJECT
MATHEMATICS & SCIENCE INSTRUCTION SURVEY

Grade/Subject Taught ____

Experience with LEP students - # years _____ # students ______

Mark each response M that applies only to mathematics, and S that applies only to science. Do not initial responses that apply to both mathematics and science.

1. What concepts and processes in mathematics and science are most important for your students to learn?

2. What concepts and/or processes in mathematics and science do your students, particularly LEP students, find most difficult?

THE ACADEMIC LANGUAGE & LITERACY TRAINING PROJECT
MATHEMATICS & SCIENCE INSTRUCTION SURVEY

3. List the major strategies you use when you teach mathematics and science. Mark with numerals (1, 2, 3) the strategies you have found most successful, especially with concepts or processes students find difficult. Underline any strategies that you use only with LEP students.

R. Hough
Georgia State University

SCIENCE PROCESSES

- OBSERVING
- MEASURING & ORDERING
- COMMUNICATING
- INFERRING
- FORMULATING HYPOTHESES
- EXPERIMENTING
- RELATING
- COMPARING & CLASSIFYING
- PREDICTING
- INTERPRETING RESULTS
- CONTROLLING VARIABLES
- APPLYING

MATHEMATICS PROCESSES

- SOLVING PROBLEMS
- FORMULATING PROBLEMS
- REASONING
- ANALYZING
- VERIFYING
- ORGANIZING DATA
- TRANSLATING/ILLUSTRATING
- COMPUTING
- ESTIMATING
- APPLYING
- COMMUNICATING
- GENERALIZING
- REPRESENTING VISUALLY
- MEASURING

Square One: Getting to Know You

1. What is your current teaching assignment and certification?

2. What is your experience in the field of mathematics?

3. Are you a member of the National Council of Teachers of Mathematics? YES___ NO___

4. How are you (or are you at all) using computers or calculators in your classroom?

5. How often (if at all) are you able to use manipulatives? What types do you use?

6. Have you had an opportunity to use cooperative learning in your classroom? If so, how?

7. What obstacles have you encountered in teaching problem solving?

8. Why are you here? Are there any specific problem areas in teaching mathematics that you would like to see addressed during this course?

Date ___________

S1/M1-Part 2
19

Name ______________

Please respond to the following questions from your personal training and experience.

1. Describe a good mathematics teacher.

2. Describe a good mathematics supervisor.

3. Describe a good mathematics student.

4. Describe a good mathematics problem.

5. How do children learn mathematics?

Session 2

CONTENT-BASED INSTRUCTION

Purpose

- Identify characteristics of language-sensitive content instruction.

LANGUAGE

Objectives

- Increase awareness of language demands and instructional potential in content area activities.
- Become familiar with important aspects of second language acquisition.

Materials

- For each group of 4-5 participants:
  2 pieces of construction paper
  10 paper clips (large & small)
  Scissors
- "Second Language Acquisition Research" (**S2/L1**) handout
- "Functions of Language" (**S2/L2**) handout
- "Strategies for Integrating Language & Content Instruction" (**S2/L3**) handout
- Use with Video Segment # 5.[6]

Introduction

- Distinguish between the primary roles of ESOL teachers and elementary classroom and middle school and high school content area teachers as they interact with ESOL students.
- ESOL Teachers: Content-based Language Instruction. The primary goal is language and literacy development. Language is taught in the context of specific content areas to keep learning and instruction meaningful and relevant to student objectives. Teachers capitalize on opportunities to use language in typical contexts for school use in other classes.
- Elementary classroom, middle and high school content area teachers: Language-sensitive content instruction. The primary goal is mastery of major concepts and processes associated with specific content area (e.g. mathematics, science, social studies), but special attention is given to the language demands and/or prerequisites for successful mastery of content area. Sensitivity to language demands is of particular benefit to ESOL students, but can also enhance instruction for

---

[6] These video segments illustrate ESOL, mathematics, or science classroom application of the concepts in this session. Video and Video Guide are available from the Bilingual/Minority Education Office of the Georgia State Department of Education.

many native English speakers. This type of instruction often addresses language-based problems for students having difficulty in the subject area.

Activities

- Discuss briefly the findings in each category of the "Second Language Acquisition" **(S2/L1)** handout. Ask participants for examples or illustrations of these principles from their experience. Consider how the range of uses for language on the "Functions of Language" **(S2/L2)** handout relate to these general acquisition principles. Be aware of these dimensions of language during the next activity.
- Divide the participants into small groups of 4-5 members. Have them number off and assign the following roles: 1) Language monitor - celebrator; 2) Materials manager - agreement checker; 3) Cutter; 4) Clipper; 5) Reporter.
- Briefly describe the responsibilities of each role. The language monitor should watch for examples of the language functions on the **S2/L2** handout that are used by group members during the completion of the task. Role 5 can be combined with 3 or 4 in a group with four members.
- The assigned task is to make a tower of any type (according to the decision of group members) in approximately 10 minutes. The reporter must then be ready to share his/her group's design -- and any interesting anecdotes about its construction -- with the other groups..
- During sharing of the group constructions, note the diversity possible with open-ended materials and tasks. After sharing, draw attention to the number and range in both quantity and quality of the language functions used in a simple, but pragmatic and interactive task. Language is a natural accompaniment to group-oriented tasks when members are assigned complementary roles all of which are necessary to reach one common goal or product. Much language occurs even when, perhaps especially when, language production is not the focus, since student attention is instead given to decision-making, negotiation, and problem-solving required to complete the task. Even limited language proficiency supports the group's construction process better than no language at all. For beginning learners of a second language, anxiety is reduced by the presence of concrete contexts for language production, opportunities for immediate concrete feedback, and several chances for next attempts that lead to task and language mastery.
- Distribute "Strategies for Integrating Language & Content Instruction" **(S2/L3)** handout. This outlines many of the strategies demonstrated in this session, and will be referenced in the next several sessions with other illustrations of classroom uses in mathematics and science activities.

MATHEMATICS

Objectives

- Integrate the process of "solving problems" to that of "finding the answer."
- Highlight the necessity of the appropriate vocabulary for the development of mathematical thinking and mastery of concepts.

Materials

- Pictures of situations that would allow for the creation of story problems (e.g. a scene at a supermarket, a baseball game, or children going to the movies).
- Newspapers and/or magazine clippings with information on demographics, salaries, economic indexes, etc.

Introduction

- Discuss typical attitude students have with mathematical problems (i.e. they look for the answer rather than a solution to the problem).

Activities

- Give examples of situations where predictable but erroneous procedures are applied to find the answer, i.e. addition when the context seems appropriate for this operation. A good example of this would be word problems involving division, multiplication, or subtraction at the end of a page with exercises on addition only.
- Give some answers, e.g. "234," and ask the participants, either in group or individually, to write different word problems.
- Present published graphs and/or charts and have participants extract meaningful information from them and write word problems that would involve the data. Of particular value would be attempts to predict erroneous solutions -- and the reasons for these -- to such problems. This is particularly useful for reviewing the concepts of fraction, percents, and decimals and for examining the conversion from one notation to the others.

SCIENCE

Objectives

- Highlight the importance of a problem solving/inquiring approach to science.
- Provide a framework, within time and facility restrictions, for as close a scientific inquiry as possible.

Materials

- Graduated cylinders, 100 ml. & 10 ml.
- Food coloring
- Water
- Borax (available in the laundry section of the grocery store)
- Guar gum (available from: Flynn Scientific, Inc., PO Box 219 Batavia, IL 60510, 1-800-452-1261)

Introduction

- Discuss how demonstrations can develop students' reasoning by helping them overcome sensationalist responses to chemical/physical reactions as they experiment and/or observe.

Activities

- Do a "Look and Listen" lab activity. Pretending the group is a high school ESOL class with very limited English proficiency, guide the participants step-by-step through the process for making slime. Divide the participants into small groups of three or four individuals.
- Hold up a plastic 100 ml. Graduated cylinder. Pour water (from a plastic milk container) up to the 100 ml. Line. Say "Put 100 ml. of water in the graduated cylinder."
- Say as you do it, "Add 2 drops of food coloring to the water in the graduated cylinder."
- Write "guar gum" on the board. Have students repeat it after you say it. Hold up the bottle as they say it.
- Show students how to find the mass of an empty plastic cup. (It is assumed that students have already been taught how to use a balance; otherwise, have the guar gum pre-measured.) Say, "Write the mass of the cup on your paper."
- Walk around to check each group's measurement and recording of data.
- Write your data on the board. Add 0.7 to your measurement. Tell students to do the same with their data. Check each group's results.
- Reset the balance with the new total. Slowly add enough of the guar gum until the balance evens out. Demonstrate and then watch as students do it.
- Say as you do it, "Pour the water into the cup with the guar gum; stir it with a straw."
- Say as you do it, "Measure 5 ml. of borax solution into a 10 ml. graduated cylinder. Put some of the powder into a jar and add water. Stir or shake until some of the borax dissolves. The excess powder should settle to the bottom of the jar.
- Say as you do it, "Pour the borax solution into the cup with the water and guar gum. Then stir with the straw."
- The "slime" mixture that results may be stored in a zip-lock bag.
- After completing this experience, lead participants in discussing the following quote: "Demonstrating new concepts can involve hands-on, show-and-tell explanations in which students follow a careful sequence of steps to understand a process. This can include having students work with materials at their seats in order to accompany the demonstration. Again, the key is for the teacher to be succinct in explanations and to continue to use the chalkboard or overhead to write key terms, concepts, and/or sequential elements."[7]

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[7] Diaz-Rico, L.T. & Weed, K.Z. (1995) The cross cultural, language, and academic development handbook. Boston: Allyn & Bacon, p. 127.

CLOSURE

Have participants work in small groups according to the subject area they teach and have them select specific academic activities that require prior vocabulary for their successful completion (e.g. in mathematics, knowing the meaning of "increase," "decrease," "reduction," "discount," etc. is essential for the solution of many word problems involving percents).

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SECOND LANGUAGE ACQUISITION RESEARCH

- Language learning occurs both consciously and subconsciously.
  - Direct teaching of structures and vocabulary
  - Focus on communication of meaning
  - Involvement in communicative interactions

- Language learning can occur without production.
  - Creative construction of linguistic system through internal processing mechanisms
  - Silent period
  - Receptive vs. productive skills

- Language learning is likely to follow natural sequences of development.
  - Order and "stages" of acquisition
  - Errors as natural stages of acquisition

- Communication can take place through a reduced system.
  - Language as a global system continually "filling out"
  - Use of communication strategies
  - Communicative effectiveness vs. formal accuracy

- Language learning is affected by a complex interplay of cognitive and social factors.
  - Language as a natural response to communicative needs
  - Attitudes and motivation
  - Use of learning strategies

FUNCTIONS OF LANGUAGE

Instrumental language - Used to get what we want. At the early stages it may be used to satisfy simple needs or wants; at later stages of sophistication, it may become more complex and take the form of polite requests, persuasion, or argument.

Regulatory language - Used to control the behavior of others. This type of language includes commands, giving directions, or at more subtle levels, manipulating and controlling others through either positive or negative language.

Interactional language - Used to establish and define social relationships. It may include negotiation, encouragement, expressions of friendships, and the kind of "maintenance" language used to work cooperatively in group situations.

Personal language - Used to express individuality and personality. Through personal language students relate their own lives to the subject matter being taught, establish their identities, and build self esteem and confidence.

Imaginative language - Used to create a world of one's own. This type of language can go beyond the boundaries of "here and now" to express fantasy through role play, drama, poetry, or stories.

Heuristic language - Used to satisfy curiosity. With heuristic language students acquire knowledge and understanding by questioning, investigating, exploring the environment, and figuring out puzzling problems.

Informative language - Used to communicate information. It is often labeled the "language of school," and includes recall of facts as well as synthesizing, and drawing inferences and conclusions from facts.

Adapted from G.S. Pinnell. (1985). Ways to look at the functions of language. In A. Jaggar & M.T. Smith-Burke (Eds.). *Observing the language learner* (pp. 57-72). Newark, DE: IRA.

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STRATEGIES FOR INTEGRATING LANGUAGE & CONTENT INSTRUCTION

Helping LEP Students Adjust to the Classroom

-- Announce the lesson's objectives and activities.
-- Write legibly.
-- Develop and maintain routines.
-- List and review instructions step-by-step.
-- Present information in varied ways.
-- Provide frequent summations of the salient points of the lesson.

Adjusting Teaching Style

-- Develop a student-centered approach to teaching and learning.
-- Reduce and adjust teacher talk.
-- Increase the percentage of inferential and higher order thinking questions asked.
-- Recognize that students will make language mistakes.

Adapting Traditional ESL Techniques to Content Classrooms

-- Bring realia into lessons.
-- Do demonstrations.
-- Use filmstrips, films, videotapes, and audio cassettes with books.
-- Have students do hands-on activities.
-- Design lessons with music and jazz chant activities.
-- Schedule sustained silent reading (SSR) sessions.

Meeting Students' Cognitive Academic Needs

-- Examine topics through students' listening and speaking skills first; then expand through reading and writing activities.
-- Be conscious of different learning styles.
-- Incorporate thinking skills activities.
-- Teach study skills using graphic organizers such as outlines, timelines, flow charts, mapping, graphs and charts, and Venn diagrams.
-- Develop students' ability to analyze texts and other written materials as a whole and at the passage level.
-- Plan activities to train students in attacking academic tasks, such as research projects, problem-solving, and essay writing.
-- Present models for writing assignments.

Adapted from Short, D.J. (1991). Integrating language and content instruction: Strategies and techniques. Washington, D.C.: National Clearinghouse for Bilingual Education.

Session 3

COMPREHENSIBLE INPUT

Purpose

- Maximize the understanding of classroom instructional language

LANGUAGE

Objectives

- Assist students in the transition from conversational to academic language
- Increase the effectiveness of instructional language for English learners
- Distinguish between BICS (Basic Interpersonal Communication Skills: the social language that people use to interact with one another, create relationships, and generally conduct personal business) and CALP (Cognitive Academic Language Proficiency: the language particular to each content are studied in school), as applied to ESOL students.

Materials

- 2x2 pieces of paper
- Markers
- Paper - blank and lined or graph
- Use with Video Segment #1, #3, #10, and/or #14.

Introduction

- Discuss the varying levels of proficiency demonstrated by English learners depending on the situation within and outside school. Describe the differences between informal conversational language BICS and CALP. Explain that BICS develops much more easily and quickly than CALP and partially accounts for the difficulty ESOL students often experience in content area classes.

Activities

- Use Cummins' Quadrant[8] as a framework for understanding the cognitive and context dimensions of difficulty for school tasks. The vertical solid line indicates greater difficulty in moving from one quadrant to another than the horizontal broken line.

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[8] Available in J. Cummins, J. (1981). The role of primary language development in promoting educational success of language minority students. Schooling and language minority students: A theoretical framework, pp. 3-49. Los Angeles: Evaluation, Dissemination, and Assessment Center, California State University.

- Discuss Chamot and O'Malley's framework for classification of language and content activities based on Cummins' quadrant[9] and the implications of the cognitive level-context level combinations in this framework for classroom activities. Take suggestions for mathematics and science activities that would fit in each of the quadrants. Application of this framework requires a large number of cognitively demanding and context-embedded activities to support the academic success for ESOL students. Mathematics and science activities throughout this course are designed to fit this requirement. The next activity is an example of this.
- Have each participant write his/her first name on the 2x2 paper square (post-it notes work well).
- Demonstrate how to mark lined or graph paper into a vertical line of boxes (about 2 fingers wide).
- Show how to write first names, one letter per box .Count the boxes used.
- Create a graph, using the number of letters as the columns. Call participants to come up and place their name square in the correct column. The uniform size of the squares will generate a bar graph.
- Ask questions about and have participants comment on the resulting graph (e.g. Are there more 4- or 6-letter names? Is there an empty set? How could we title the graph?). ESOL students use the familiar content of their names in combination with the new skills of 1:1 correspondence, creating and interpreting graphic data, using comparative terminology. Many variations are possible, including graphing the ethnic groups represented by students in a diverse class.
- Ask participants to bring to the next session an example of an instructional material they might use with ESOL students in either mathematics or science.

MATHEMATICS

Objective

- Model procedural and conceptual knowledge with the appropriate academic language.

Materials

- Blank paper
- Markers

Introduction

- Discuss the importance of low risk initiation tasks to those students reluctant to participate in mathematics activities. Examples might include repeated addition prior to the introduction of multiplication and word problems involving relatively simple solutions before more complex problems.

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[9] Chamot, A.U. & O'Malley, J.M. (1987) The cognitive academic language approach: A bridge to the main-stream. TESOL Quarterly, 21(2), 217-249.

Activities

- Divide participants into groups of 4-5 members.
- Give each group one blank sheet of paper and one marker.
- Instruct the first person to draw a rectangle in the middle of the sheet (demonstrate as you give direction). Then have the paper and marker passed to the person to the left.
- Tell/show each successive person to draw diagonal lines to connect the corners of the rectangle to the corners of the page, passing the materials each time on to the next person.
- Continue this process by numbering the resulting spaces on the page (it will resemble a framed window). By this time each group member will have handled the paper and contributed to the final product before the "reluctant" students have had a chance to say "I can't do this."
- Now the participant with the paper starts asking preference questions (related to mathematics or science) that can be answered yes/no, e.g. Do you like to work story problems? Would you want to visit the rain forest? Count up the "yes" answers and put a word/graphic representing the question in the appropriately numbered space. Keep passing the sheet until each member has asked at least two questions. This should give ESOL students an opportunity to hear models of questions and response forms which they could apply in an activity that would follow and would involve mathematical concepts. Examples, depending on the background of the students, include the prime factorization of composite numbers, the Least Common Multiple and/or the Greatest Common Factor, and the classification of polygons according to the number of sides and angle measurement.

- **SCIENCE**

Objective

- Demonstrate ways of supporting understanding of technical language with concrete and culturally relevant materials.

Materials

- "Cross-cultural Notes" **(S3/Sc1)** handout

Introduction

- Read Walt Whitman's comment on English language:

> View'd freely, the English language is the accretion and growth of every dialect, race, and range of time, and is both the free and compacted composition of all.[10]

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[10] Whitman, W. (1885, November). Slang in America, North American Review.

Ask for comments or additions. Discuss some possible difficulties many of the features of the English language present to ESOL students.

- Ask for comments and for suggestions on contributions of ESOL students to linguistically and ethnically diverse content classrooms?
- Ask participants to define culture and how it affects communication. Discuss, cautioning participants about the tendency to overgeneralize when examining cultural differences. Remind them that individual differences occur among all groups and stereotypic thinking should be avoided.
- Distribute the "Cross-cultural Notes" **(S3/Sc1)** handout. Break into groups of 3-4 members. Ask each group to find a situation from the handout and develop a short role-play of a scenario that relates in some way to mathematics or science instruction in a classroom setting.
- After about seven minutes, allow the different groups at each site to perform off-camera. Tell them that after all groups have finished, they will select one (or two) group(s) to perform on-camera for all participants at each site.

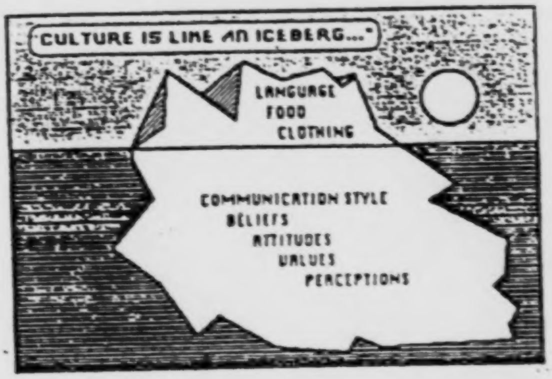
CLOSURE

Have participants list examples of situations where BICS may and should be used to enrich CALP (e.g. use standard units of measurement commonly used to expand knowledge about them in a laboratory setting).

CROSS-CULTURAL NOTES

Notes and Anecdotes are from the book, The Culture Puzzle: Cross-Cultural Communication for English as a Second Language, by Deana R. Levine and others. TIPS are from the vast experience and wisdom of Ernie Blankenship. (You should not take the last sentence literally!)

What is culture? Culture is knowledge, beliefs, and behavior shared by a group of people. People use cultural knowledge and beliefs to understand their own experience and to guide their own actions and behavior.



A cultural description is rarely true for all people. In cultural learning, it is necessary to make general observations about groups of people. Sometimes this leads to overgeneralizations or stereotypes. Some may be completely incorrect. Others may not consider individual differences at all. Stereotypes can create a false view of another culture. There are always differences among people in any group!

1. In Vietnam, people often use special forms of address. A person calls his older brother or sister "older brother" or "older sister" without using a name.
2. In Japan, co-workers or classmates do not usually call each other by their first names. They use the last name followed by a title ("San").
3. In North Africa, men often call each other "Mister" ("As-sa-ic") with the first name. Sometimes when Americans are in North Africa, they are addressed in this way, for example, "Mister Michael".
4. Latin Americans, North Africans, and Middle Easterners are examples of cultural groups that tend to stand closer together when talking than Americans do. People from some Asian cultures tend to stand farther apart when talking than Americans do. In Japan, a person usually stands farther from a boss or a teacher than from a friend.
5. People from different cultures sometimes don't understand why Americans give so many compliments. In many cultures, too many compliments would seem insincere. For example, many Japanese think that Americans give too many compliments. A Japanese woman said that she might give a compliment once a week. An American woman said that she gives at least one compliment a day.

6. A Chinese woman from Hong Kong, after 14 years in the U.S., said, "It is still difficult for me to say, 'Thank you' when someone gives me a compliment. I still want to say, 'No, no, It's not true'. I like when people compliment me, but I don't feel modest or humble if I accept a compliment with a 'Thank you'".

7. In some countries, giving money to a teacher or supervisor to show appreciation is usual.

8. Americans notice right away when people don't smile in the same situations as those in which they smile. American businessmen think that Japanese businessmen look too serious in photos because they usually don't smile. Many Americans think that Russians don't smile enough or smile at the "wrong" time. Of course there is no "right" or "wrong" time to smile. People's cultural backgrounds often influence when and how often they smile.

9. Misunderstandings can occur when someone from a different culture tries to communicate nonverbally and an American doesn't notice or understand the nonverbal communication. This can also happen between two Americans.

10. People show that they are listening in different ways. Japanese speakers use a listening sound that sounds something like "mm mm" to show that they are paying attention to the speaker. They make this sound very often when listening.

11. Attitudes toward interrupting and asking questions are different across cultures. Although many American parents may not like constant interruptions, they generally encourage their children to ask questions. In some cultures, questions from children are not appreciated. One Hispanic woman said that she and her friends get upset with their children if they ask too many questions. Some Chinese parents apologize if their children talk too much and ask too many questions.

12. A Chinese student in an ESOL class said, "My English teacher tells me I should interrupt and ask questions when I don't understand, but for me, it is very rude to interrupt someone. I would rather ask a friend later if I don't understand something."

    TIP: Check for understanding more frequently with LEP students by asking specific questions. Don't ask, "Do you understand?" The answer will almost always be, "Yes" despite the opposite being true.

13. An immigrant said, "When I ask my American boss, 'Please repeat,' he often repeats everything he said before, only louder, and faster. Why doesn't he speak more slowly when he repeats? Why does he repeat so many sentences? Usually, after he repeats, I still don't understand."

    TIP: After giving directions to a regular class that has some LEP students in it, repeat the directions more slowly and more concisely.

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14. A Japanese man once told a friend, "Americans sometimes interrupt and seem impatient when I speak. Sometimes they don't give me time to decide what to say; I need time to think about what to say in English. I also need to think about how to say it to the person I'm talking with."

TIP: Use extended wait time after asking a LEP student a question.

15. In some cultures, it is very rude to tell someone that they are wrong or that they have made a mistake, especially in front of other people. The person can become embarrassed, and can "lose face". In these cultures, people sometimes use nonverbal signals to let someone know when they have said something wrong. Over the telephone or face-to-face the person may use silence to let the speaker know that he or she has said something wrong. Americans may not always understand what the silence means.

TIP: Do not criticize a LEP student in front of the class. It is usually best to pull any student who has said or done something wrong aside and correct him/her privately.

16. A group of Japanese people were talking about the American phrase, "In other words". One Japanese woman said, "If I repeat your idea in my own words, then I feel that I am saying to you, 'Your explanation is not good enough'. I don't want to embarrass you. Even if I don't understand everything you say, I will not check my understanding or summarize what you say. I don't want you to think that I am criticizing your explanation."

TIP: If a student memorizes the notes you give and feed them back verbatim on a test, don't penalize them for not using their own words.

17. An Ethiopian man who worked in a hotel restaurant talked about a frustrating experience: "When the kitchen staff have a meeting, I never ask any questions or say anything. Sometimes I want to, but by the time I decide how to say what I want to say, it's too late. They're already talking about something else."

TIP: When explaining new concepts, go slowly. Seek clarity of understanding by asking specific questions before going from one concept to the next. Wait longer between questions to allow all students to process the question and form an answer.

18. Not all conversations in every language are like ping-pong games, with the speakers going back and forth and taking turns to speak. In some languages, it is usual for one person to speak for a long time or to speak more than the other person. For example, a boss, teacher, or older person might talk and not expect the other person to say anything.

TIP: In a conversation with a LEP student, you may have to initiate a response from the student by asking, "What do you think?"

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19. Greetings and openings in most languages really mean almost the same thing, but sometimes their word-for-word translations are very different. The following all mean, "How are you?" but are expressed differently.
    "Hi. What are you doing?" (Tagalog--spoken in the Phillipines)
    "Hi. Have you eaten yet?" (Chinese/Vietnamese)
    "Peace. What can be heard?" (Hebrew)
    "Peace be with you. How is your condition?" (Arabic)

20. "This was the first day I worked in my factory. I could not speak English. I only said 'Hello' and then I smiled to show that I wanted to make friends. During the break, I sat with my co-workers and we talked a little. When I saw some people I liked I said, 'Hello'. They told me not to just say 'Hello' because they have names. They said I should use their names. The next day I said, 'Good morning, Mary. How are you?' She answered, 'Very well, Thank you.' It was just a simple conversation, but it was contact. Later we became very friendly with each other." --Vietnamese man

    TIP: LEP students must be a little out-going in order to learn the language. Encourage them to interact with English-speaking students by designing activities that require cooperation in pairs or with small groups. If you have two or more LEP students in the same class that speak the same language, keep them separated so that they will not insulate themselves from others. If they need to help each other understand what was taught, they will find a way to converse with each other outside of class!

21. "See you later" is a way of saying "goodbye" in American English and it often does NOT mean, "I'll see you later". An American woman said, "See you later" to a new immigrant in the U.S., who understood it literally. The American said it to her friend as they were leaving an office building. The American went one way, but the immigrant friend stayed in front of the building for twenty minutes! Later she told her friend about this and was very embarrassed about the misunderstanding. This is how she remembers her first week in America.

    TIP: Avoid using idioms. Try to be literal in everything you say. Also do NOT use sarcasm for any reason!! It could be taken literally and lead to a misunderstanding and hurt feelings.

22. In some cultures, there are certain times when you can talk about money and other times when you can't. Sometimes families have rules about this. One man from France said that he had always been told that people shouldn't talk about money while they are eating.

    TIP: Do not ask LEP students about their financial status. It could put them in an awkward position. If you suspect that a student cannot afford to buy notebook paper or pencils, give them some when they are needed.

23. Many people from Vietnam have said that, "How much do you weigh?" is a common and acceptable question in the Vietnamese culture. Many Vietnamese students were surprised when their American teacher told them, "I would never tell my weight to anybody, not even my husband!"

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24. In some cultures, people really enjoy having heated discussions. For example, a man from Spain said that a conversation is always more interesting if people disagree about something and then discuss their reasons. A man from Israel said that heated discussions are very common in his country. He said, "If I go to a party and nobody is arguing about politics, there's something wrong with the party!"

    TIP: If you notice two LEP students arguing in their own language in the halls or at lunch, use discernment before interrupting them. If you are worried that the conversation is too heated, ask them, "Are you angry with each other?" It will be obvious from the way they respond to the question what actions you should take.

25. An American observed a difference between Saudi Arabians and Americans in the way conversations begin. She said that every time her Saudi friends called her on the phone, they always asked, "How is your husband?", "How are your children?", or "How are your parents?" She said that she sometimes felt that it took too long to get to the point of the conversation.

26. In many cultures, it is rude to say directly, "No, I can't come." Even if a person knows that he or she cannot accept an invitation, the response might be, "Yes, I'll come." An American might think that the person was not telling the truth. There are many cultures where people do not say "No" directly to another person.

    TIP: Do not be disappointed if several LEP students tell you their parents are coming to an Open House yet don't show up.

27. Some students from Argentina said that they never call each other before visiting. An American asked them, "What happens if you're busy when your friends come and visit?" They all agreed that they would stop what they were doing and would spend time with their friends. The American asked, "Would you tell them that you have things to do and can only spend an hour (for example) with them?" One of the Argentinians answered, "Oh, no. That would be rude. I would spend as much time with my friends as they wanted to spend with me."

28. Mark, an American doctor, was working in a hospital in Arizona where many of the patients and nurses were American Indians. Mark said to one Indian nurse, "We need to get information on the patient in Room 62." When the nurse did not answer, Mark became annoyed and said, "Alright, I'll go get it myself!" Then the Indian nurse realized what had happened. She explained, "The information is on that table. I pointed with my lips. I guess you didn't notice. In our culture, it's okay to point with your lips."

29. Americans are often criticized for being too informal. In many cultures a person who acts informally, especially in business and in teaching relationships, is considered unprofessional or not serious. Many Americans act informally to show that they trust or feel comfortable with the person to whom they are talking. Since trust is important in good business and teaching relationships, many Americans use informal language and dress informally to help everyone feel comfortable quickly. However, what makes people in one culture feel comfortable can make people feel uncomfortable in another culture.

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Session 4

ADAPTED MATHEMATICS AND SCIENCE INSTRUCTION

Purpose

- Separate procedural from conceptual knowledge required in a given task.
- Design lesson plans which include specific vocabulary relating to both procedural and conceptual knowledge.

LANGUAGE

Objectives

- Develop strategies to facilitate the integration of language and content instruction.
- Support high level thinking through context-embedded activities.

Materials

- Participant-provided sample instructional material
- "Strategies for Integrating Language & Content Instruction" **(S2/L3)** handout
- "Lesson Plan Format: Integrated Instruction" **(S4/L1)** handout
- Use with Video Segment #2 .

Introduction

- Discuss the importance of including materials and procedures for both language and content objectives in plans for ESOL students.
- Introduce the "Lesson Plan Format: Integrated Instruction" **(S4/L1)** handout as one framework for plans with such combined emphases.

Activities

- Group participants who teach comparable grade levels together. Have them share their sample instructional materials. Ask questions such as, What are the language and cognitive demands of the material? What context is provided to help students understand important concepts? Refer back to Cummins' Quadrants (Session 3) and have participants fit some of their suggested activities into the appropriate quadrant.
- Recommend the **S4/L1** as a guide for the lesson plan assigned as part of the course requirements. Have partners discuss how it could be used with the sample instructional materials.

- Continue discussion on ways to make the transition from high cognitive level/high context to high cognitive level/low context and the importance of visual aids to support language/literacy development within content lessons.

MATHEMATICS

Objective

- Distinguish different kinds of knowledge involved in mathematical reasoning.

Materials

- Bingo chips, colored math strips, and number tiles

Introduction

- Discuss the need to relate algorithmic procedures to mathematical processes.

Activities

- Have the participants list the most commonly used methods to teach a given topic (e.g. place value and the four basic operations).
- Involve participants in dividing the listed approaches into feasible categories.
- Within each category separate concepts, from procedures, from notations. Use and encourage participants to use the materials listed to illustrate different forms to address the same concept.
- Discuss the aspects of each approach that might require special attention to the language involved and introduce manipulatives when appropriate.
- Discuss sample lessons from a current lesson plan book.
- Have participants work on a lesson plan on operations and place value using a given sample as a guide.

SCIENCE

Objective

- Identify and employ process skills with ESOL students.

Materials

- Transparency sheets
- Cotton balls
- Graphing paper
- Pencils

- "Shapes Sheet" **(S4/Sc1)** handout
- "To Blink or Not to Blink" **(S4/Sc2)** handout

Introduction

- Have participants identify as many process skills used in science experiences as they can. Examples might include: observing, collecting data, measuring, inferring, graphing data, interpreting graphs, drawing conclusions, recognizing patterns.
- Discuss why it is important to teach process skills to ESOL students as well as to provide them plenty of opportunities to practice and master them.

Activities

Classification

- Give each participant a copy of the "Shapes Sheet" **(S4/Sc1)** handout. Tell them to examine each shape on the sheet carefully. Allow participants to pair off. Tell each pair to come up with a classification scheme that will begin with two categories and then branch into enough categories so that each of the 12 shapes is separated into its own category. Tell them to write the scheme on a piece of paper.
- After 5-8 minutes, allow several pairs to share their schemes [with distance learning, the sheets may be put on ELMO so others can see them). Ask for other ways of classifying the same shapes.
- Discuss ways this activity could be expanded in a regular classroom (different colors, shapes cut out, etc.).
- Ask participants to share other classification activities they have used successfully.
- Identify aspects of current science curricula used in their classrooms that could give students practice in using classification schemes.

Collecting Data & Drawing Conclusions

- Give each participant a copy of the "To Blink or Not to Blink" **(S4/Sc2)** handout. Hand out colorless transparency sheets and cotton balls. (Enough participants will have a watch with a second hand or digital reading of seconds.)
- After participants complete the activity, ask them what modifications would be needed to use this activity with their ESOL students.
- Allow time for participants to share other process skills activities they have successfully used with their ESOL students.

CLOSURE

Present a series of exercises/activities and have the participants distinguish between the kinds of knowledge involved (e.g. in problems of subtraction involving regrouping, it is important to distinguish the act of automatically "borrowing" from the complete understanding of the value of digits in different places of a given number).

# LESSON PLAN FORMAT: INTEGRATED INSTRUCTION

THEME:

LESSON TOPIC:

OBJECTIVES

Language Skills

  Speaking/Listening:

  Reading/Writing:

  Structures:

Content Skills:

Thinking/Study Skills:

Key Vocabulary:

LITERATURE:

MATERIALS:

- -

MOTIVATION:

PRESENTATION:

PRACTICE/APPLICATION:

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REVIEW/EVALUATION:

EXTENSION:

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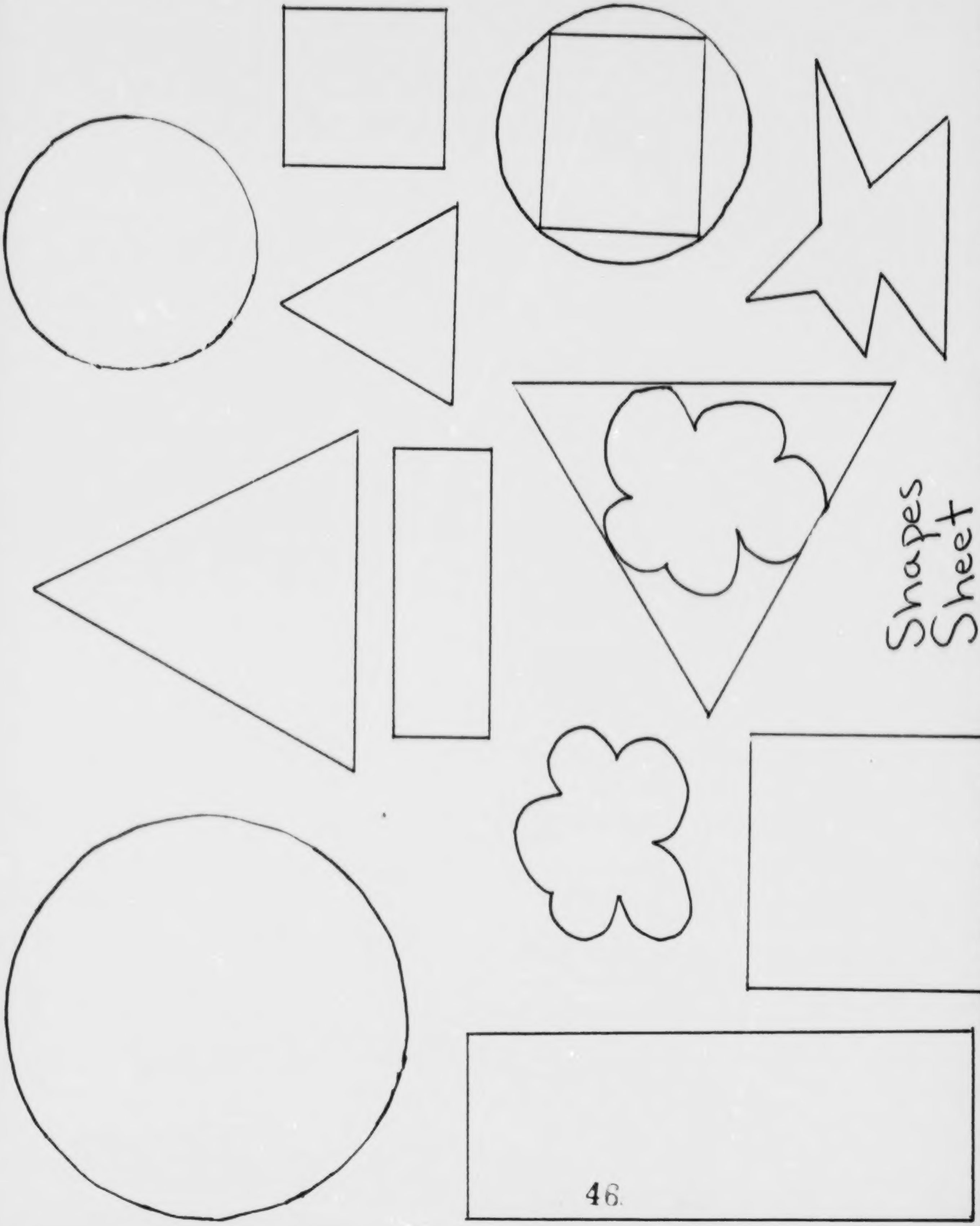

Shapes Sheet

"To Blink Or Not To Blink"

Activity One

Step #1....Look at your partner's eyes.

Step #2....Count the number of times he/she blinks during one minute. (Your partner should call out a minute's time; a watch with a second hand will be provided if neither of you wear one.)

Step #3....Repeat this for three additional trials. (One minute each!)

Step #4....On the chart below, record your data (results):

Trial	You	Your Partner
1		
2		
3		
4		
Total		
Avg.		

Step #5....Total the number of blinks for all four trials.

Step #6....Find the average.

Step #7....Reverse roles--your partner will count the number of times you blink during one minute and find the average as you did above.

Activity Two

Step #1....Have your partner time you to see how long you can go without blinking. Try hard not to blink!

Step #2....On a separate sheet of paper, construct a chart similar to that in Activity One.

Step #3....Record your data (in seconds).

Step #4....Run three additional trials.

Step #5....Take the average of all four trials.

Step #6....Reverse roles and run four trials for an average.

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Activity Three

Step #1....Hold a piece of clear plastic in front of your face and, in particular, your eyes.

Step #2....Try not to blink as your partner throws a large piece of cotton at the plastic.

Step #3....Below the chart from Activity Two, construct a similar chart. However this time, rather than recording the time in seconds, record whether or not you blinked.

Step #4....Run four additional trials.

Step #5....Reverse roles and repeat the steps above.

****

Conclusions:

1. Describe the findings of these activities. Be sure to support your findings with the data you obtained. (You and your partner may confer on this. However each of you should describe the findings in your own words.)

2. Discuss advantages and disadvantages of your findings as they relate to you. (Do not confer with your partner on this!)

Session 5

DEVELOPING BACKGROUND KNOWLEDGE

Purpose

- Identify real-life experiences that might be relevant to the concepts to be taught.
- Determine the essential academic vocabulary for a given lesson and relate it to the equivalent nonacademic speech.
- Identify culturally-centered activities highlighting aspects that make them so.

LANGUAGE

Objectives

- Evaluate the cognitive demands of different school tasks.
- Develop techniques to identify prior knowledge.
- Increase receptive and expressive vocabularies.

Materials

- Buttons and scoops
- Screws, bolts, and nuts
- Paper and pencil
- "Strategies for Integrating Language & Content Instruction" (**S2/L3**) handout
- Use with Video Segment #6, #8, and/or #12.

Introduction

- Review the third and fourth sections of the "Strategies" (**S2/L3**) handout and compare these recommendations to the characteristics of Quadrant III activities in the Chamot & O'Malley framework.[11]

Activities

- Discuss the importance of using familiar materials as a way of increasing learner self-confidence and building on prior knowledge. Brainstorm materials that could be used in this way to teach important mathematics and science concepts.
- Illustrate the instructional advantages of collections of common objects with the following demonstration:

---

[11] Chamot, A.U. & O'Malley, J.M. (1987) The cognitive academic language approach: A bridge to the main-stream. TESOL Quarterly, 21(2), 217-249.

- Divide participants into groups of 4-5 members. Have one member from each group come to the front and get one scoop (from coffee or detergent) of buttons for the group to analyze. Ask the groups to predict how many buttons they have, then count them and compare the results with their predictions.
- Compare numbers across groups. Hypothesize reasons for the differences.
- Have groups compare the buttons and describe them in as many ways as possible (in a real classroom setting have students generate lists of these descriptors. If writing skills do not permit, suggest that the teacher act as a scribe).
- Have the groups separate the buttons into piles according to common attributes. Add technical vocabulary terms (e.g. shank) when appropriate. Have each group create a semantic map to record the different categories and attributes and then share some findings with the rest of the class.
- Variations of this activity can be done with collections of other easily collected objects that parents or school staff may be willing to contribute, e.g. yarn, small metal pieces (nuts, bolts, screws, etc.), pasta, keys.

MATHEMATICS

Objective

- Relate new knowledge to previous knowledge using a constructivist perspective.

Materials

- Smarties candy
- Baseball cards
- Professional journal articles, such as:
- Smith, M.S. & Silver, E.A. (1995). Meeting the challenges of diversity and relevance. Mathematics Teaching in the Middle School, 1, 442-448.
- Minicucci, C., Berman, P., McLaughlin, B., McLeod, B., Nelson, B., & Woodworth, K. (1995). School reform and student diversity. Phi Delta Kappan, 77(1), 77-80.
- Taylor, L., Stevens, E., Peregoy, J.J., & Bath, B. (1991). American Indians, mathematical attitudes, and the Standards. Arithmetic Teacher, 39, 14-21.
- Zaslavsky, C. (1991). Multicultural mathematics education for the middle grades. Arithmetic Teacher, 39, 8-13.
- Strutches, M. & Perkins, F. (1994). Mathematically empowering parents and children through multicultural literature. Becoming, 6, 13-15.
- Lucas, T., Henze, R., & Donato, R. (1990). Promoting the success of Latino language-minority students: An exploratory study of six high schools. Harvard Education Review, 60, 315-340.
- Thornburg, D.G. & Karp, K.S. (1992). Lessons learned: (Mathematics + science + higher-order thinking) x second-language learning = ? The Journal of Educational Issues of Language Minority Students, 10, 159-184.

- Winograd, K. & Higgins, K.M. (1994/1995). Writing, reading, and talking mathematics: One interdisciplinary possibility. The Reading Teacher, 48, 310-318.
- Wood, K.D. (1992). Fostering collaborative reading and writing experiences in mathematics. Journal of Reading, 36, 96-103.

Introduction

- Choose a concept that is particularly difficult for many students and discuss its different features (e.g. operations with mixed numbers and fractions: whole numbers, rational numbers, division, ratio, percents -- stress vocabulary and notation used in different contexts).

Activities

- Have participants discuss and share main ideas of articles read by different groups.
- Introduce a new topic, percents for example, with the question "Tell me what you know about....".
- Work with participants on a logical organization of their input, expanding when appropriate/possible.
- Pass baseball cards out and discuss statistics on back that are relevant to the topic of percents.
- Use colored M&M candy to play percent games (e.g. calculate first the ratio and then the percent of "red" to "brown," or "green" to the "rest" - include notation and conversions).

SCIENCE

Objectives

- Ernie's motto: "Every teacher is an English teacher and, by extension, an ESOL teacher."

Materials

- Ammonia solution
- Goldenrod construction paper
- Clear candle
- Mister spray bottle

Introduction

- Share experiences with ESOL students with participants.

Activities

- Invisible ink:
  1. Tape several pieces of goldenrod paper together to form a banner.

2. Write a message on the paper with a clear candle. It should appear invisible at a distance. A good message would be, "Every teacher is an English teacher."
3. Post the banner on the wall in the front of the room [with distance learning, make sure the banner is within one of the camera's reach].
4. Ask participants if they like the message. They will wonder what you are talking about.
5. After a pause, spray the banner with a weak solution of ammonia from a mist bottle (can be found in gardening stores). The hidden message will appear as the paper not protected by the candle wax will turn red. The message will show up in orange.

- Explain that goldenrod is a chemical in the paper that is orange when neutral or acidic. In the presence of a base (such as ammonia), the indicator turns red.
- Separate participants into groups according to the age of the students with whom they work.
- Have each group design a lesson plan around the invisible ink activity. Encourage the participants to search for answers as to the chemicals, processes, and materials involved will provide a great opportunity for language usage and scientific exploration.

CLOSURE

Have the participants work in small groups -- preferably with participants with whom they have not worked before -- on an inventory of new knowledge and new vocabulary they have acquired due to the course they are taking together and how they are likely to use these.

Session 6

LINKING NEW CONCEPTS WITH PRIOR KNOWLEDGE

Purpose

- Develop academic language for mathematics and science topics.

LANGUAGE

Objectives

- Demonstrate how the nature of language changes from social to academic depending upon the circumstances surrounding its use.
- Apply the K-W-L[12] [Know - Want to know - Learned] **(S6/L1)** strategy as an effective classroom teaching tool.

Materials

- One juvenile non-fiction book for each small group of participants.
  Each book should be on a different topic and should be selected for the academic language it contains. The text should contain vocabulary and terminology both specific to the topics and used in school textbooks. Handouts **S10/l1** and **S10/L2** include a bibliography on shells and on volcanoes respectively.
- One "K-W-L" **(S6/L1)** transparency and marker for each small group
- Big chart or chalkboard placed next to overhead screen
- Scrap paper
- Use with Video Segment #2.

Introduction

- In a whole group setting, review BICS and CALP (Session 3). Discuss the need for CALP for the successful mastery of concepts in subjects such as science, math, social studies, and language arts. Note that parents are primarily concerned with BICS development while teachers are responsible for students' CALP development in all subjects of instruction.
- Suggest that the upcoming demonstration will help them understand the difference in social and academic language demands on their students.

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[12] Ogle, D.M. (1986). K-W-L: A teaching model that develops active reading of expository text. The Reading Teacher, 39(6), 564-570.

Activities

- Break the audience up into small groups of 4-6 each. Make groups as homogeneous as possible according to grade level (for elementary teachers) or content specialty (for middle and secondary teachers).
- Assign a topic to each group, selecting topics normally included in the mainstream curriculum of the audience. The weather, rocks, mammals, electricity, and fire safety might be good depending on the grade levels represented.
- Use a "K-W-L" **(S6/L1)** transparency and the overhead to explain the "K-W-L" strategy. Groups will discuss what they already know about their assigned topic and list these facts in the "K" column of the transparency. Each group should have their own transparency. In the "W" column they will make a list of questions of what they want to know to further their knowledge of the topic. After filling in the "W" column, they will be given a book about their topic. Together they will explore new information and list their findings in the "L" column of the worksheet.
- Remind the participants that the "K-W-L" strategy can be effectively adapted for use in their own classrooms. It provides a good structure for cooperative learning activities. For the regular classroom, plain paper might be easier to work with. However, sharing results on the overhead makes a nice speaking activity which is very popular with students.
- Have each group select a reporter who will share group results at the end of the demonstration. Suggest that the recorder may want to take notes of the group discussion on scrap paper and then make a neat copy on the transparency.
- Assign each group their topic and instruct them as follows: Forget school. You are a group of friends talking about the topic. Jot down 5-6 things that your group already knows about the topic. Emphasize they have only five minutes to do this, so they do not need to write everything they know.
- After five minutes, stop the groups and tell them to generate questions about what they would like to learn about their topic beyond what they already know. Again, they will only have five minutes to do this.
- After five minutes, stop the audience. Give each group a book on their assigned topic. Have the participants research their topic as a school assignment. They should jot down in the "L" column 5-6 new and interesting things they learn, whether these answer their questions in the "W" column or not. They will have about 15 minutes to research and make notes on their transparency to report to the whole class.
- The facilitator should move among the groups to answer questions about the process and keep slower groups aware of time so that everyone finishes together. Groups may need an extra few minutes to copy group notes from the scrap paper to the transparency for reporting.
- Have the whole audience stop and face the overhead projector screen for group reports.
- Begin group reports by having reporter put "K-W-L" transparency on the overhead and tell report what their group knew, wanted to learn, and learned about their topic. As the reporter talks, the facilitator writes on the chart or board changes from BICS to CALP language and uses of specific CALP terms. Try to include a variety of vocabulary, grammatical constructions, and content specific terminology.

- Ask participants to bring to the next session at least one science and/or mathematics text or textbook that they might use with ESOL students.

MATHEMATICS

Objective

- Link the development of mathematics to the needs of people across history.

Materials

- Geoboards
- String
- Rubber bands
- Pencils
- Reproduction of geoboards on paper **(S6/M1)**

Introduction

- Discuss the Egyptian roots of the Pythagorean theorem and its evolution in Greece. Attach the accomplishments to the cultural values of both societies.

Activities

- Work with participants on "building" the bases of square pyramids on the geoboard. Use the sides of the bases as the "legs" of a right triangle and one of the diagonals as the hypotenuse.
- Have participants make a list of the relevant vocabulary and write sentences describing the processes developed.
- Have participants work in groups with geoboards creating figures described on the geoboard reproductions.

SCIENCE

Objective

- Build scientific vocabulary for familiar and discrepant events.

Materials

- Balloon
- Zip-lock bag
- Water
- Bucket or plastic dishpan

Introduction

- Probably relying too much on the universality and linearity of cognitive development, teachers often assume that students have more in common than they actually do. Those students who are new to America and have not had many experiences similar to those of their American peers, more frequently than not have among themselves backgrounds that are equally diverse. These differences can be a barrier to learning. Providing opportunities to relate mathematics and science to common daily objects and events can make these sometimes abstract content areas more meaningful for all students.

Activities

- Take a balloon and fill it with water. Ask the participants what will happen if you poke a pencil into the balloon. Record their hypotheses. Then do it over a bucket or dishpan. (It pops.)
- Take a zip-lock bag and fill it with water. Ask the partipants to predict what will happen if you poke a pencil all the way through the bag. Record their hypotheses. Then do it. (Don't pull the pencil back out. It does not pop.)
- Ask participants to explain their observations.
- If no one gets the "right" answer, explain what a polymer is. Explain that the polymer in the latex balloon was not as large as that in the plastic of the zip-lock bag. In the latter, the huge molecule is able to grip around the pencil and seal itself.
- As time permits, demonstrate or allow participants to experiment with the processes of making these other polymers: latex rubber bands, polyurethane foam, and cross-linked glue (GAK).[13]

CLOSURE

Have each participant do a K-W-L page on teaching mathematics or science to ESOL students. Collect these and use them as a guide for future sessions.

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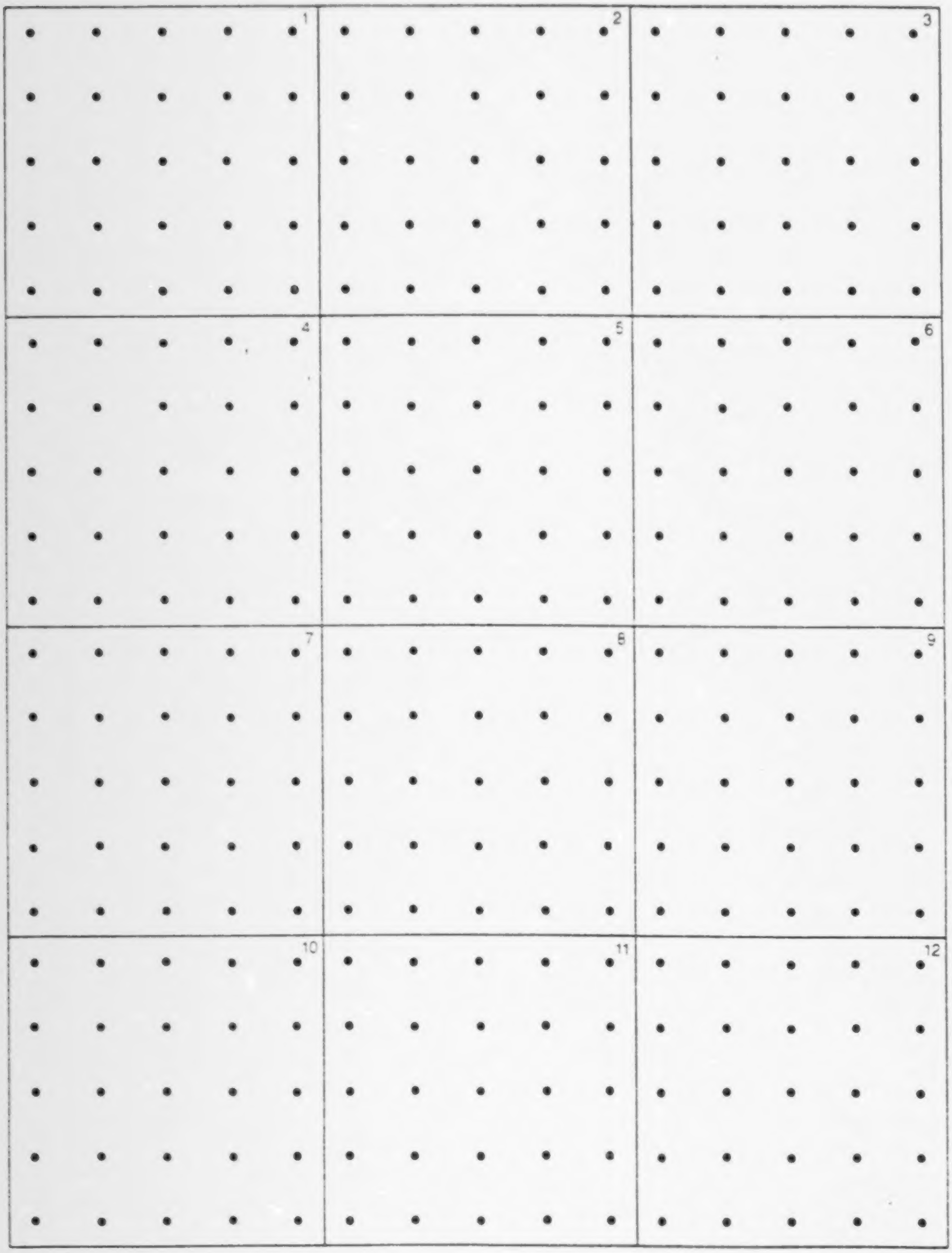
[13] For more information on these products please see, Jester, L.A. (1992) A chain reaction. Science and Children, 29(4), 12-15.

K-W-L STRATEGY

(Know - Want to know - Learned)

KNOW	WANT TO KNOW	LEARNED



Session 7

DEVELOPING ACADEMIC LANGUAGE

Purpose

- Improve strategies for comprehending mathematics and science instructional materials.

LANGUAGE

Objectives

- Analyze language demands of content area texts.
- Apply criteria for selecting and adapting content area materials for ESOL students.

Materials

- Participant-provided content area texts
- Sample texts with features highlighted
- Sample graphic organizers
- "Analyzing Content Area Materials for ESOL Students" **(S7/L1)** handout
- "Selecting and Adapting a Content-Area Text for Use with Learners of English" **(S7/L2)** handout
- "Strategies for Selecting, Adapting and Using Content Area Materials for ESOL"**(S7/L3)** handout
- "Venn Diagram" **(S7/L4)** handout
- Use with Video Segments #11 and/or #14.

Introduction

- Discuss the general difficulties ESOL students have in comprehending content area texts. Identify particular areas of concern with mathematics and science texts currently being used.

Activities

- Have participants who teach comparable grade levels work in pairs. Distribute handouts **S7/L1**, **S7/L2**, and **S7/L3** and have pairs use them as guides to examine the text materials they brought.
- Ask participants questions such as: What types of information did the analysis yield? What is most helpful? What was most surprising? Would the handouts help in using texts more effectively with ESOL students?
- Highlight those text features common to nonfiction books which ESOL students may not have mastered, e.g. illustrations that compare the sizes of unfamiliar and common objects,

boldface print signaling a glossary entry, photographs and accompanying cutaway drawings, captions, table of contents, index.

- Which of the uses recommended on the **S7/L3** handout would improve the accessibility and usefulness of the sample texts?
- Use **S7/L4** handout as a graphic organizer which is another way to enhance understanding of content area texts. Other possible formats include: compare-contrast charts, semantic maps, distinctive feature matrices, problem-solution charts, and time lines.

MATHEMATICS

Objective

- Explore mathematics as a language which requires its own vocabulary, symbols, and grammar.

Materials

- Participant-provided mathematics textbooks
- Manipulatives and materials that might be helpful in solving problems from the above mentioned textbooks (e.g. connecting cubes, beads, place value charts, etc.)

Introduction

- Discuss the need for mathematical representation to either solve or better understand certain kinds of problems.

Activities

- Have the participants work in small groups according to the level of the textbook each has brought.
- Have each group select "problem solving/word problems" sections of their textbooks and discuss different ways to represent information and highlight the benefits of one over the other (e.g. improper fractions versus mixed numbers, decimals versus fractions, calculator versus mental mathematics, or even inflation versus salary increases for a given school system for a determined period of time).
- Stress the need to search for solutions for problems written in English using mathematical language and symbols. Remind the participants that the solution must then be expressed in English.
- Have different groups share their "translations" from one language into another.

SCIENCE

Objective

- Use cognitive-academic language to make predictions and report observations of discrepant events.

Materials

- 2 soft drink aluminum cans
- Hot plate
- Bowl of cold water
- 4 flasks (or long-necked jars)
- Food coloring
- Latex balloon
- Penny
- "Strategies for Working with ESOL Students" **(S7/Sc1)**

Introduction

- For each of the following demonstrations, ask participants to predict outcomes in each phase of the experiments and, then, to report their actual observations. Encourage comparisons and shifts from use of informal language to more precise scientific terminology.

Activities

Pressure

- Rinse two soft drink aluminum cans. Leave a little water in the bottom of the cans.
- Heat the cans on a hot plate until steam comes out the opening.
- After one or two minutes, use tongs to invert the can in a clear glass bowl of cold water. The can should collapse instantly. REASON: as the liquid and air in the can is heated, the molecules move faster and take up more space. When inverted in cold water, the air molecules in the can slow down. Thus they do not hit the sides of the container as often. There are more air molecules outside the can. The inside pressure cannot equalize the outside pressure because the can's opening is under water and more air cannot enter to replace the air that was driven off with heat.

Convection

- Half fill four identical flasks or long-necked juice bottles with water. Add yellow food coloring to two of the bottles and blue food coloring to the other two.
- Out of view of the audience, heat the water in the bottles with the yellow water. (The water can be heated prior to this demonstration and stored in a thermos bottle.)
- Just before performing the demonstration, add enough water to completely fill each bottle.

- Put a piece of hard plastic (or glass or ceramic) on top of a bottle with yellow (warm) water. Then invert the bottle on top of a bottle with blue (cold) water.
- Ask participants to predict what will happen when you remove the plastic.
- Remove the barrier and ask for descriptions of what happens. (Most students predict the two colors will mix and turn green. However, the yellow on top stays yellow and the blue below stays blue.)
- Now repeat the process putting the blue (cold) water bottle on top of the yellow. Again ask for predictions and observations.
- This time when the barrier is removed, mixing occurs rapidly. Some participants may guess that the blue and yellow liquids were different substances. Eventually someone will hypothesize that the liquids have different temperatures and that heat rises. REASON: the warmer the water's molecules, the more rapidly the molecules move. When the warmer water is on the bottom, a convection current is set up to disperse the heat.

Inertia

- Insert a penny in a colorless latex balloon.
- Blow up the balloon as tightly as possible and tie it off.
- Move the balloon in a circular motion to get the penny rolling around the inside of the balloon.
- Once the penny is moving rapidly, stop moving the balloon and watch the motion of the penny. It will continue rotating for a fairly long time. REASON: Newton's First Law of Motion states that an object in motion will stay in motion unless a force such as friction between the penny and the balloon acts to change its motion.

CLOSURE

Have the participants form small groups according to subject/grade level they teach. Ask each group to examine one chapter of a textbook and search for language that might create difficulty for ESOL students.

ANALYZING CONTENT AREA MATERIALS FOR ESOL STUDENTS

Content Area ____________________ Title ______________________________

Grade Level ____________________ Unit/Chapter ______________________

Vocabulary

- Essential new vocabulary

- Known vocabulary used in a new way

Grammatical Structures

- New word forms or verb tenses

- New sentence structures

Discourse Organization

- Paragraph organization

- Chapter/unit organization

Prior Knowledge

- Concepts requiring pre-teaching

- Unfamiliar cultural assumptions

Learning Strategies

- Reading

- Writing

- Chart/graph

- Other

Adapted from A.U. Chamot & J.M. O'Malley, (1994). The CALLA handbook. Reading, MA: Addison-Wesley

Selecting and Adapting a Content-Area Text for use with Learners of English

Title of text: Content area:

Strengths of the text for English learners:

Problems of the text for English learners:

Possible remedies:

Conclusion:

Is this text appropriate?

If so, how will you adapt and use it?

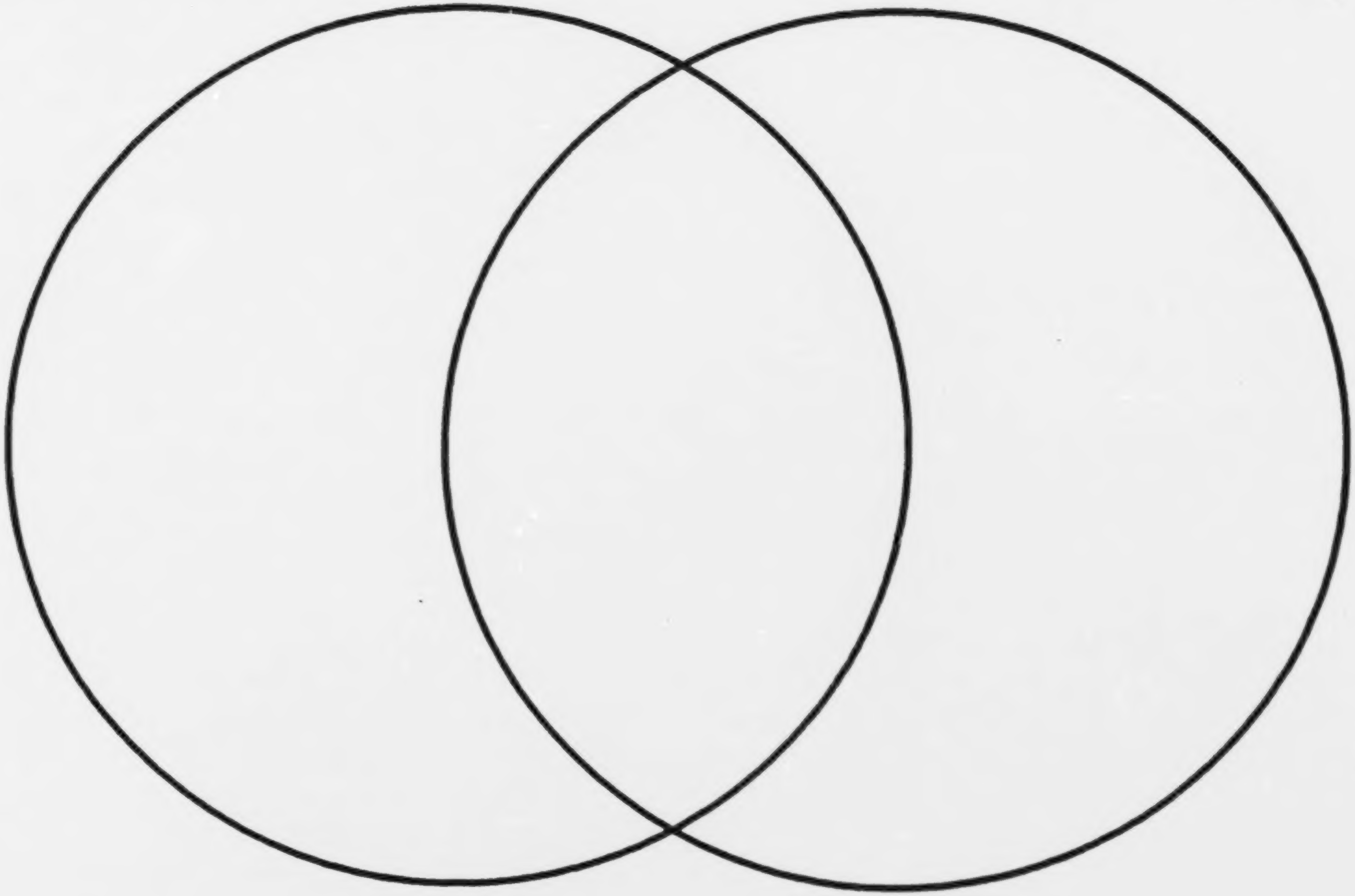
STRATEGIES FOR SELECTING, ADAPTING AND USING CONTENT AREA MATERIALS FOR ESOL

Criteria for Selecting Materials	• Materials are clearly and simply written. • Length is manageable. • There are many pictures that are closely related to written text. • There are many charts and graphs. • There are many hands-on activities to use with text. • The text is clearly demarcated with headings, sub divisions and bold text for important points. • Materials take a multicultural point of view in illustrations, selection of materials, and background information expected
Adapting less-than-ideal Materials	• Select excerpts including key points • Find translations • Supplement with or substitute more accessible materials
Using Materials	• Use directed reading -- preview, read, review. Ask many questions to guide and check comprehension. • Teach students learning strategies for getting to the essence of text. • Use text in combination with highly interactive activities, e.g., jigsaw, numbered heads. • Address and discuss cultural bias that is present; add other cultural points of view.

S7/L4
62

Venn Diagram

Title:_______________ _______________**:Title**



STRATEGIES FOR WORKING WITH ESOL STUDENTS

(Developed by Ernie Blankenship, Meadowcreek HS, Gwinnett Co. GA)

MOTTOS:

Every teacher is an English teacher.

Every teacher is an ESOL teacher.

Most strategies you employ with your ESOL students will also have tremendous benefits for all your students.

Become COLOR-BLIND but not CULTURE-BLIND!

++++++++++ COMMUNICATING BETTER ++++++++++

1. Speak clearly in short, complete sentences.
2. Use a normal tone of voice.
3. Use gestures to help make your point.
4. Use lots of visual aids and concrete objects.
5. Write key words on the blackboard or overhead.
6. Smile often to communicate warmth.
7. Keep on talking to a student even if you are convinced he/she will not understand a word you say.
8. Avoid using idioms. If you tell a student "cut it out," he may

wonder what it is that needs cutting and where the scissors are.

9. Do NOT use sarcasm !! Studies have shown that many students who are native English speakers are adversely affected by sarcasm. Common sense dictates that LEP students would likely take the sarcasm seriously; if the sarcasm is personal in nature, they might be deeply hurt.

(((((((((((((((STRATEGIES)))))))))))))

1. Maintain high expectations. Whereas you may lower the reading level of your written materials, be careful not to lower the ability level of your LEP learners.
2. Use extended wait time. It will take an ESOL student longer to process the information. They may need extra time to translate what they are asked into their own language, think through the problem, and then translate their response into English.
3. Use motivational stickers. Students of all ages enjoy receiving self-adhesive smiley-face stickers or those that say something like, "Super work."
4. Wish your students a Happy Birthday when it arrives. On the first day of class I have students complete an informational sheet for me. From that I write each student's birthday on my calendar.
5. Research your students' country and culture. Find out about holidays. Let the students know that you are aware of the holiday and they will eagerly tell you more about it.
6. Use mnemonic devices. The first one I ever learned was "A Rat In The House May Eat The Ice Cream." I have never misspelled the work "Arithmetic." With any list you want your students to memorize, you can make up a memory device. It is beneficial for students to make up their own and share it with the class.

7. Use cooperative learning activities. Since each student on a cooperative learning team is responsible for the outcome, an LEP student is encouraged to interact in English.

8. Use humor. Find ways to interject amusement into every lesson. Do some crazy things, like calling out the answers to a worksheet while standing on your desk.

9. Never allow a student to ridicule another student.

10. Teach etymology of new terms. Breaking a word down facilitates incorporation of it into a student's working vocabulary.

11. Practice pronouncing new vocabulary terms. Practice with large group and individuals.

12. Use drill and practice games to review for tests.

13. Use flashcards.

14. Repeat, repeat, repeat, repeat, repeat, repeat.

15. Write down main ideas and give it to ESOL students before a test.

16. Allow students to copy main ideas 10 times for extra credit. (Some students are most comfortable with rote learning.)

17. Make up a fewer-response test for the main ideas.

18. Don't penalize the ESOL student for grammatical errors in essays.

19. Don't use "teacher glare" as a discipline avoidance strategy. (Some students may fear the "evil eye.")

20. Avoid using detention for discipline if transportation is a major problem. (Try having the student write 25 times, "I will not talk when I am expected to listen to my teacher.")

21. INDIVIDUALIZE AND ADAPT!!!

Session 8

GROUP INVESTIGATIONS

Purpose

- Experimenting and reporting in collaborative student groups.

LANGUAGE

Objectives

- Integrating mathematics and science concepts with relevant academic language.
- Interpreting graphic and pictorial representations with appropriate language.

Materials

- Weather forecast maps from old newspaper (at least one per student)
- Paper and pens
- "Principles for Language & Literacy Learning" (**S8/L1**) handout
- Use with Video Segment #7.

Introduction

- Review the "Principles for Language & Literacy Learning" (**S8/L1**) handout. Ask participants to generate classroom illustrations of these principles as they apply to mathematics and science instruction.

Activities

- Weather is a good topic to demonstrate these principles for several reasons. Weather is a high interest topic across cultures and time periods. It is meaningful to all students as it impacts their daily experiences. Information on the topic is readily available but is also highly changeable, so that the information is always fresh. Weather data is recorded and reported in a variety of ways, offering many different open-ended opportunities for instruction with students of varying levels of content and language proficiency.
- Participants should work in groups with 2-3 members. Distribute weather forecast maps from newspapers. A group might get maps from several successive days, or from the same date on different months, or days representing different seasons.
- Start by identifying the types of information contained in each section. Offer help in figuring out the terms, codes, graphics, and abbreviations used, providing language labels as needed.

- Make comparisons of the weather data within and/or between maps. For example, have the participants compare the forecast temperature with the actual temperature recorded on several successive days, find the hottest and coldest location in the U.S. on a given date, find two locations with similar weather conditions.
- Findings can be reported orally or in written form. Questions may be posed by either the teacher or class members.

MATHEMATICS

Objective

- Distinguish between concept knowledge and content labeling in the solution of equations.

Materials

- Balance
- Numerical blocks
- Pawns

Introduction

- Relate session purpose to National Council of Teachers of Mathematics (NCTM) Standards which focus on the importance of explaining problem-solving processes. It might be advisable to have different volumes of the Standards so as to enable the participants to use the material either during the sessions or at home. A list of some of these books includes:

Assessment Standards for School Mathematics (1995). Reston, Virginia: NCTM.

Hirsch, C.R. (Ed.) (1992). Curriculum and evaluation - standards for school mathematics, addenda series, grades 9-12: Connecting mathematics. Reston, Virginia: NCTM.

Hirsch, C.R. (Ed.) (1992). Curriculum and evaluation - standards for school mathematics, addenda series, grades 9-12: Data analysis and statistics. Reston, Virginia: NCTM.

Hirsch, C.R. (Ed.) (1992). Curriculum and evaluation - standards for school mathematics, addenda series, grades 9-12: Geometry from multiple perspectives. Reston, Virginia: NCTM.

Hynes, M.C. (Ed.) (1996). Ideas - NCTM standards-based instruction. Reston, Virginia: NCTM.

Activities

- Explain the basic idea of solving equations with balances.
- Make the connection between solving equations on the board [with distance learning, do this on ELMO] and using a balance.
- Solve equations on paper while making mental references to the balance. Use the vocabulary involved in the solution of equations (e.g. transformations, elimination, equivalent equations, etc.).
- Have participants, in small groups, solve equations on paper. Have them take turns using the balance to illustrate the steps in their solutions. Have each group write equations to be solved by the other groups using both paper and the balance. Stress the importance of acquisition and application of specific vocabulary for the mastery of the concept.

SCIENCE

Objective

- Develop technical vocabulary to accurately express basic principles of center of gravity and electricity.

Materials

- One electric cord
- Cut out paper butterflies and two pennies (one set per participant)

Introduction

- Discuss principles informally encouraging students to use the appropriate vocabulary.

Activities

- Do demonstration of "circle of light":

Background information:
Electricity is provided in one of two ways. Direct current (DC) provides electricity as a flow of electrons in the same direction. Batteries use direct current. Outlets in Europe are usually direct current. Alternating current (AC) provides electricity as a flow of electrons that are constantly reversing their direction. Outlets in America use AC. The following demonstration helps students visualize the difference.

DC demo:
Attach a small battery-operated pen light to a string. In a darkened room rotate the light by swinging the string in a circle. The students will observe a circle of light that is unbroken.

AC demo:
You may need some help from Radio Shack to assemble this device. Take a small extension cord and cut off the end that does not plug into the wall outlet. Then splice in a small light source (LED). Plug the extension cord into the outlet. Turn off the room lights. Swing the portion of the extension cord with the LED in a circle in the same fashion as you did for the DC demo. The difference is startling. This time rather than seeing a continuous circle of light, students will see a circle that is broken at intervals. (These intervals show that the electrons reversed direction causing a break in the circle of light.)

- Have participants take notes stressing both specific vocabulary and basic concepts.
- Have participants balance paper cutouts on their noses (butterflies and/or eagles are particularly popular for this activity) while speculating on the causes for the phenomenon.
- Make a brief presentation on principle of center of gravity: the point of balance of an object or the point where all the mass of an object is centered.
- Have participants work in small groups to locate the center of gravity for different objects (books, notebooks, erasers, and other school supplies are appropriate for this activity).

CLOSURE

Have all participants collaborate to critique the session in terms of what aspects of it were strengthened by having activities done in group. Generate a single list of suggestions/endorsements. Would individual work be better for the day's activities? Would there be activities better suited for group work?

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PRINCIPLES FOR LANGUAGE & LITERACY LEARNING

♦ **Active Participation** - Students learn both content and language through active engagement in academic tasks that are directly related to a specific content.

♦ **Social Interaction** - Students learn both content and language by interacting with others as they carry out activities.

♦ **Integrated Oral and Written Language** - Students become more able language learners when language processes are integrated in a variety of ways and for a variety of purposes.

♦ **Real Books and Real Tasks** - Students learn to read authentic texts and to write for useful purposes.

♦ **Background Knowledge** - Students' prior knowledge of a topic may be activated through classroom activities drawn from a variety of language sources.

Source: S. Hudelson as cited in L. T. Diaz-Rico & K.Z. Weed (1995). The crosscultural, language, and academic development handbook. Boston: Allyn & Bacon, p.116.

Session 9

AUTHENTIC ASSESSMENT

Purpose

- Identify different forms of assessment.
- Relate instruction to ongoing as well as formal assessment.

LANGUAGE, MATHEMATICS, AND SCIENCE

Objectives

- Select assessment format according to desired learning outcomes

Materials

- "Sample Assessment Instrument for Content-Specific Language Functions" (**S9/L1**) handout
- Use with video Segment #10 and/or #13.

Introduction

- Discuss the weaknesses of paper and pencil tests alone which do not accurately measure the total learning of most students, particularly ESOL students. Define good assessment as that reflects different learning styles through a collection of a variety of data. Ask participants to consider the impact of the following ideas on ESOL students in content area classes.[14]
  1. Allow students to demonstrate knowledge and skills that are worth knowing.
  2. Considering constraints of time and resources, create contexts that are rich, realistic, and enticing.
  3. Focus on the "big ideas" or concepts rather than trivial details or specialized skills
  4. Include both teacher-student and student-student interactions.
  5. Promote the development and display of students' strengths and expertise.
  6. Include non-routine challenges that require the integration of knowledge and skill from several topics and across disciplines.
  7. Continuous evaluations are in-depth and lead to the discovery of problems and questions.
  8. Focus on the ability to achieve quality of performance, rather than a single right answer.
  9. Evaluations may be done easily and safely within a classroom.

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[14] For developing effective alternative assessments, see Wiggins, G. (1989). A true test: Toward more authentic and equitable assessment. Phi Delta Kappan, 70, 703-71, and Wiggins, G. (1992). Creating tests worth taking. Educational Leadership, 48, 26-33.

Activities (Language, Mathematics, & Science)

- Give participants a copy of a sample alternative assessment (this should match the population the participants are already serving or are likely to serve in the near future). Discuss the advantages and disadvantages of using it with ESOL students. Then have participants match up with others who teach the same grade and subject. Each team should develop a draft outline of an alternative assessment they could use with their students. Afterwards, allow time for sharing.
- Discuss reasons for different kinds of assessment and relate the desired outcome to the chosen teaching approach and assessment design.
- Present the portfolio as an effective means to follow student's growth over a period of time. They may be entirely different for each student or they could have certain components in common. Portfolios must, however, contain examples of the student's work and opportunities for student introspection. The following five characteristics have been suggested for all portfolios:
  1. Portfolios are dynamic: they change as the student and the curriculum changes.
  2. Portfolios are student-centered: the student is the primary decision-maker with the teacher as a secondary decision-maker engaged in a collaborative process.
  3. Portfolios have a purpose: they are deliberate and selective such that the student should have explicit reasons why items are included in the portfolio.
  4. Portfolios can be content-specific: they can be designed to address domain-specific concepts important to science learning.
  5. Portfolios are reflective as well as educative tools: they are more than cameo shots of learning and represent an ongoing motion picture of the student as learner.[15]

  Ask participants to consider how these practices might impact ESOL students.
- Present the weather as a unit that would provide a good opportunity for integrating science, mathematics, BICS, and CALP, and cultural elements through a portfolio approach. From building a barometer and learning inverse relationships from it, to learning about popular weather sayings from different cultures, to enriching common language with scientific vocabulary, to comparing weather patterns in the U.S. and their home countries, the weather may be a tangible way of detecting cumulative learning and allowing all students, ESOL in particular, to verify their own growth. Good sources of activities are:

  Molengraft, L.M. (1992). *Weather. Primary Whole Language Theme Unit.* Grand Rapids, MI: Instructional Fair, Inc.

  Williams, D. (1991). *Weather Thematic Unit.* Huntington Beach, CA: Teacher Created Materials, Inc.
- Include oral discussion, science and mathematics vocabulary, reading, and writing in the unit's activities. Have students work in small groups to identify appropriate assessment for such a unit. Use Sample Assessment Instrument for Content-Specific Language Functions (**S9/L1**) as a guide.

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[15] Lane, C.L. & Tippens, D. (1994). Alternative assessment of science learning: The use of portfolios. The Georgia Science Teacher, 35, 5-7.

CLOSURE

Brainstorm ideas for what could be included in a portfolio to show an ESOL student's progress in the development of mathematics, science, language, and literacy over a period of months.

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Sample Assessment Instrument for Content-Specific Language Functions

For each statement, rate current student performance as:

(N)not at all (S)some of the time (M)very well most of the time

LISTENING: THE STUDENT IS ABLE TO

1. Understand explanations without concrete referents.
2. Follow directions for experiments.
3. Understand oral numbers.
4. Understand oral word problems.

SPEAKING: THE STUDENT IS ABLE TO

1. Answer questions.
2. Ask for clarification.
3. Participate in discussions.
4. Explain and demonstrate a process.
5. Present oral reports.
6. Explain how an answer was derived.

READING: THE STUDENT IS ABLE TO

1. Understand specialized vocabulary.
2. Understand information/explanations in textbooks.
3. Find information from graphs, charts, and tables.
4. Follow directions for experiments.
5. Find information in reference materials.
6. Read at varied rates (skimming and scanning).
7. Read mathematical notations and equations.
8. Understand written word problems.

WRITING: THE STUDENT IS ABLE TO

1. Write answers to questions.
2. Note observations.
3. Describe experiments.
4. Write reports.
5. Label maps, graphs, and charts.
6. Write verbal input numerically.

Session 10

MULTI-SENSORY MATERIALS

Purpose

- Apply ideas from different disciplines presented.
- Utilize various media.
- Explore relationships among highlighted concepts.

LANGUAGE

Objectives

- Evolve from using oral language derived from the manipulation of concrete objects to developing specific literacy skills.

Materials

- Collection of shells
- Blank paper
- Markers
- Collection of nonfiction books on shells
- Sample graphic organizers
- "Selected Bibliography of Shell Resources" (**S10/L1**) handout
- "Volcano Bibliography" (**S10/L2**) handout
- Use with Video Segment #9, #13, and/or #15.

Introduction

- Discuss the negative reactions many students, including ESOL students with limited research skills, have toward nonfiction books. Many students express opinions similar to that of the cartoon character Calvin when he complains to Hobbes that he has to write a report on bats, a "stupid" topic because he knows nothing about it. Hobbes comments that he supposes that research is out of the question. Calvin replies scornfully, "Oh, like I'm going to read about bats, and then write the report. Right!"
- Discuss the usefulness of well-designed instructional scaffolding to make the transition from hands-on activities to related literacy activities.

Activities

- Have participants work in pairs. Distribute shells to the different groups and direct each pair to select two shells that they find interesting to analyze further.
- Tell pairs to look for similarities and differences in the features of their shells.
- Distribute paper so that each pair can make a Venn diagram to record these similar and different features. Encourage pairs to use precise vocabulary, making suggestions when appropriate. Assign each completed diagram a capital letter and hang them in alphabetical order on a wall above a table or shelf. Then assign the pairs (and their shells) numbers at random which they should write on a sheet of paper large enough to hold their shells. Arrange these on the table/shelf. Have participants try to match the shell pairs with the correct Venn diagram. This will point out the importance (and often difficulty) of using precise vocabulary to describe sometimes small differences. Check the matches when everyone has finished.
- As a follow-up, record on a K-W-L **(S6/L1)** chart the questions raised by the pairs during their examination of the shells. Distribute books similar to those listed on the bibliography. Highlight those decision-making processes effective readers use in finding information to answer specific questions.
- Encourage participants to identify features of the books that were particularly helpful. Discuss the advantages of researching a topic stimulated by self-selected questions rather than assigned topics.
- If time allows, describe another simple format for initiating simple research projects titled the QUAD chart. This chart has three columns: QU for the question, A for the answer, and D for additional details. This format is especially useful for groups of students with a wide range of content and language proficiency, since it is possible to be successful with either very brief or more elaborated responses.
- For further study, distribute the Volcanoes bibliography as another illustration of the types of books, some of which are published in series covering a range of topics, that can be used to supplement textbooks in the classroom.
- Ask participants to bring a newspaper for the next class.

MATHEMATICS

Objective

- Highlight the changing demographics of metropolitan schools and the consequent need for more flexible and cosmopolitan teachers.

Materials

- "Fun & Easy: Painlessly Incorporating the Standards into your Daily Routine" **(S10/M1)** transparency and handout
- "Planning Questions" **(S10/M2)** transparency and handout

Introduction

- Discuss concepts of metacognition, constructivism, and the uses of effective questions in the context of stressing the central theme of a lesson and how it relates to other themes in both mathematics and other subject areas..

Activities

- Discuss changing demographics and consequent requirements of educational systems.
- Discuss the different stages of a lesson (planning, implementation, evaluation). Use video clips available in your system or from the *Video* produced by this project which is available on a check-out basis at The Bilingual/Minority Education Office of the Georgia State Department of Education.
- Distribute handouts "Fun & Easy: Painlessly Incorporating the Standards into your Daily Routine"**(S10/M1)** and invite participants to qualify each of the items on it.
- Separate participants in groups of two or three and have each group design a lesson plan using "Planning Questions" **(S10/M2)** handout as a guide.
- Have participants, as a whole group, answer the question, How could these features support understanding of important concepts and processes by ESOL students?

SCIENCE

Objective

- Plan activities which support combinations of observing, questioning, hypothesizing, problem-solving, explaining, and reporting results.

Material

- Plastic or paper cups
- Coffee filters
- Markers
- Water
- "Who's Been Using the Candy Machine? Laboratory" **(S10/Sc1)** handout
- "Make a Puzzle" **(S10/Sc2)** handout

Introduction

- Discuss the importance of active participation and verbal interactions to support scientific reasoning.

Activities

Radial Chromatography

- Give each participant a plastic or paper cup, a piece of filter paper (small coffee filters or absorbent paper towels will work if regular filter paper is not available), and a small pie-shaped wedge cut from another piece of filter paper.
- Tell each person to poke a hole in the center of the paper with a pen.
- Have available a variety of water soluble markers. Tell participants to put a few spots of marker near the hole on the filter paper (black markers work best).
- Insert the pie-shaped wedge into the hole so that a portion of it sticks through to the other side.
- Pour water to fill 3/4 of the cup.
- Wipe off the rim of the cup so that it is dry.
- Place the filter paper over the cup so that the pie-shaped wedge is in contact with the paper.
- Observe the filter paper as the water begins to spread out the pigments in the marker ink on the paper.
- When the water advances to the outer edge of the paper, remove the filter. Place it on a paper towel (or over an empty cup) to dry.
- Discuss how this activity can be modified for each age group: What opportunities are there to develop or practice scientific concepts, reasoning skills, and language/literacy skills?
- Additional activities of this type are included in the "Who's Been Using the Candy Machine? Labortory" **(S10/Sc1)** and "Make a Puzzle"**(S10/Sc2)** handouts.

Additional Interactive Ideas:

- Bingo-type games with beans as place markers may be used to provide practice for any content the teacher wants to reinforce. For example, the teacher wants to reinforce the symbols of common elements. Each card should contain randomly placed symbols. During play, the teacher calls out an element, which the students then cover.
- Encourage participants to share examples of teacher-made games. Ask the question: How can any of these structures involve ESOL students in elaborated verbal interactions in nonthreatening ways?

CLOSURE

Have the participants form small groups according to subject/grade level they teach. Ask them to share successful/unsuccessful attempts at using manipulatives in the classroom. When are manipulatives helpful, and when are they distracting to the students? Should educators use them more frequently with ESOL students - why?

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SELECTED BIBLIOGRAPHY OF SHELL RESOURCES

Amos, W.H. (1984). Exploring the seashore. Washington, DC: National Geographic Society. [BOOKS FOR YOUNG EXPLORERS SERIES]

Guided by a marine biologist, two young children examine some of the many forms of life found along rocky and sandy shorelines and in salt marshes.

Coldrey, J. (1987). The world of crabs. Milwaukee: Gareth Stevens Publishing. [WHERE ANIMALS LIVE SERIES]

Simple text and photographs depict crabs feeding, breeding, and defending themselves in their natural habitats.

Coldrey, J. & Goldie-Morrison, K. (Eds.). (1986). Hide and seek. NY: G.P. Putnam's Sons.

Text and photographs present animals which have permanent or intermittent camouflage capabilities which aid in both preying and protecting.

Dance, S.P. (1989). Seashells. Secaucus, NJ: Chartwell Books.

Doubilet, A. (1991). Under the sea from A to Z. NY: Crown Publishers.

Presents photographs of exotic marine life from A to Z.

Feeney, S. & Fielding, A. (1991). Sand to sea: Marine life of Hawaii. Honolulu: University of Hawaii Press.

Fine, J.C. (1989). Creatures of the sea. NY: Atheneum.

Describes sea creatures with unusual appearances or behaviors that allow them to fit successfully into their underwater environment.

Johnson, R.L. (1991). The Great Barrier Reef: A living laboratory. Minneapolis: Lerner Publications.

An account of various research projects involving the animal and plant life of Australia's Great Barrier Reef.

Moore, P.D. (Ed.). (1987). Encyclopedia of animal ecology. Oxford, England: Equinox Ltd.

Morris, S. (1990). The concise illustrated book of seashells. NY: W.H. Smith Publishers.

Parker, S. (1988). Pond & river. NY: Knopf. [EYEWITNESS BOOKS SERIES]

A photo essay about the range of plants and animals found in freshwater throughout the year, examining the living conditions and survival mechanisms of creatures dwelling at the edge of the water, on its surface, or under the mud.

Parker, S. (1989). Seashore, NY: Knopf. [EYEWITNESS BOOKS SERIES]

A photo essay introduces the animal inhabitants of the seashore, including fish, crustaceans, smails, and shore birds.

Pratt, K. J. (1994). A swim through the sea. Nevada City, CA: Dawn Publications.

Sabelli, B. (1979). Simon & Shuster's guide to shells (H. S. Feinberg, Ed.). NY: Simon & Shuster Inc.

Selsam M. E. & Hunt, J. (1983). A first look at shells. NY: Walker and Company. [SERIES]

An introduction to seashells, explaining how they are classified and describing the differences that distinguish one kind of seashell from another.

Silver, D.M. (1993). One small square seashore. NY: W.H. Freeman and Company. [SERIES]

Examines small portions of a sandy East Coast beach and a rocky West Coast shore and describes the life they support.

Sowler, S. (1992). Amazing armored animals. NY: Knopf. [EYEWITNESS JUNIORS SERIES]

Introduces a variety of armored animals and describes how they defend themselves with built-in spines, spikes, scales, shells, and other types of outer coatings.

Sowler, S. (1992). Amazing animal disguises. NY: Knopf. [EYEWITNESS JUNIORS SERIES]

Introduces animal disguises involving camouflage and mimicry, in such animals as the zebra, polar, and caterpillar.

Taylor, B. (1992). Pond life. NY: Dorling Kindersley, Inc. [LOOK CLOSER SERIES]

Examines the variety of life found in ponds, including the common newt, stickleback, and great diving beetle.

Volcano Bibliography

Asimov, I. (1981). ***How did we find out about volcanoes?*** **New York: Walker and Company. [SERIES:** ***How did we find out about ...?*****]**

Discusses the features of a volcano, the causes of eruptions, and the locations of active volanoes on earth and elsewhere in our solar system.

Bramwell, M. (1986). ***Volcanoes and earthquakes.*** **New York: Franklin Watts, Inc. [SERIES: Earth Science Library.]**

Explains how volcanoes are formed, volcanic features, and how to measure and predict earthquakes.

Fradin, D.B. (1982). ***Disaster! Volcanoes.*** **Chicago: Childrens Press.**

Describes the characteristics of volcanoes, why and how they erupt, and how eruptions are predicted. Also discusses famous volcanoes throughout the world and describes the May, 1980 eruption of Mount St. Helens.

Greenberg, J.E., & Carey, H.H. (1990). ***Volcanoes.*** **Milwaukee: Raintree Publishers.**

Describes several volcanoes in different areas of the world, the causes and stages of eruption, and potential benefits of vocanoes.

Lambert, D. (1986). ***Earthquakes and volcanoes.*** **New York: Bookwright Press. [SERIES: Topics.]**

Explains some of the dramatic earth tremors and eruptions that have happened in the past. It also looks at the causes of these natural disasters and at how people can protect themselves from them by predicting when they will occur.

Lambert, D. (1985). ***Volcanoes.*** **New York: Franklin Watts, Inc. [SERIES: Easy-Read Fact Books.]**

Compares different types of volcanoes and volcanic processess. Discusses several existing volcanoes on Earth and other planets and explains the process of predicting eruptions.

Lauber, P. (1986). *Volcano: The eruption and healing of Mount St. Helens.* New York: Bradbury Press.

An account of how and why Mount St. Helens erupted im May 1980 and the destruction it caused, and a discussion of the return of life to that area.

VanCleave, J. (1994). *Volcanoes: Mind-boggling experiments you can turn inot science fair projects.* New York: John Wiley & Sons, Inc. [SERIES: Spectacular Science Projects.]

Includes several science projects that can help students understand volcanic processes.

Van Rose, S. (1992). *Volcano & Earthquakes.* New York: Alfred A Knopf.

Photographs and text explain the causes and effects of volcanoes and earthquakes and examine specific occurences throughout history.

Whitfield, P. (1990). *Why do volcanoes erupt?* New York: Viking Penquin Inc.

This beautifully illustrated book answers this and more than one hundred other intriguing questions about our wonderful planet.

FUN & EASY: PAINLESSLY INCORPORATING THE STANDARDS INTO YOUR DAILY ROUTINE

DOTTIE WHITLOW VERNON

I. Map - Do you know where you're going?

- Be deliberate
- Be selective
- Consolidate
- Do an overview of Chapter/Unit/Test

II. The Standards - Math "Power" for All

- Constructivism
- Cognitive Psychology
- Active Learning
- Confidence & Attitude
- Open ended questions & problems

III. The First Four Standards

- Problem Solving
- Reasoning
- Communication
- Connections

IV. Atlanta Math Project - Model for Professional Growth

Teacher as Learner and Learner as Teacher

- Plan
- Teach
- Reflect

V. You! - The Most Important Resource You Bring to Any Learning Situation

PLANNING QUESTIONS

Dottie Whitlow Vernon

1. How can I make this active?

2. Will manipulatives work here?

   If "Yes", Then Use Them.

   If "No", Then ... will something "real world" work here? newspapers, menus, cookbooks, blueprints, pictures, baseball cards, bicycles, maps, ...

3. How will learners "experience" the information? Directly, indirectly, lecture, exploration, ...?

4. How will students understand how this "applies" to their lives, "construct" their own meaning, ...?

5. How will I "assess" this information, attitudes, experiences, ...?

WHO'S BEEN USING THE CANDY MACHINE? LABORATORY

Background: Mr. Deederbopper, Lacy and Louie all love candy and frequently use the candy machine in the office. However, Mr. D. likes only brown M&M's; Lacy likes only tan M&M's and Louie likes only brown Reese's Pieces ..... all of the other colored candy gets thrown away. This gets to be very wasteful and expensive; so Mr. D., Lacy and Louie decided not to get anymore candy out of the machine. The next day there were smudges all over the candy machine knob .... someone didn't stick to the agreement. Mr. D., Lacy and Louie spent the day accusing each other of getting the candy and no one got any work done. The piece of clue paper that you have has the smudge from the knob. Using paper chromatography, can you figure out who used the candy machine.

Materials:

- 1 tan M&M
- 1 brown M&M
- 1 brown Reeses Piece
- large beaker
- straws
- masking tape
- water
- 3 strips white paper towel
- 1 clue strip w/smudge

Procedure:

1. Label the clue strip w/ pencil (why)________________
   ____
   Tape the end (w/o the smudge) to a straw and let the smudge end hang down in the beaker. Add enough water to get the very end of the paper wet but NOT the smudge.
2. Let the water rise about 3/4 up the paper. What do you notice happening? ____________________________
   ____
3. Remove the clue strip and allow it to dry.
4. Label the other 3 strips of paper (in pencil) at one end. "brown M&M, tan M&M, brown RP"
5. Wet the coating on each piece of candy and make a smudge about 1" from the bottom of each strip and allow to dry.
6. When dry, tape each strip to a straw - not touching each other, and hang them on the beaker so that the ends are in the water. The water level must be below the smudges.

Conclusion:

Remove strips after the water travels 3/4 way up. Compare the 3 strips to the clue strip. Which one matches?

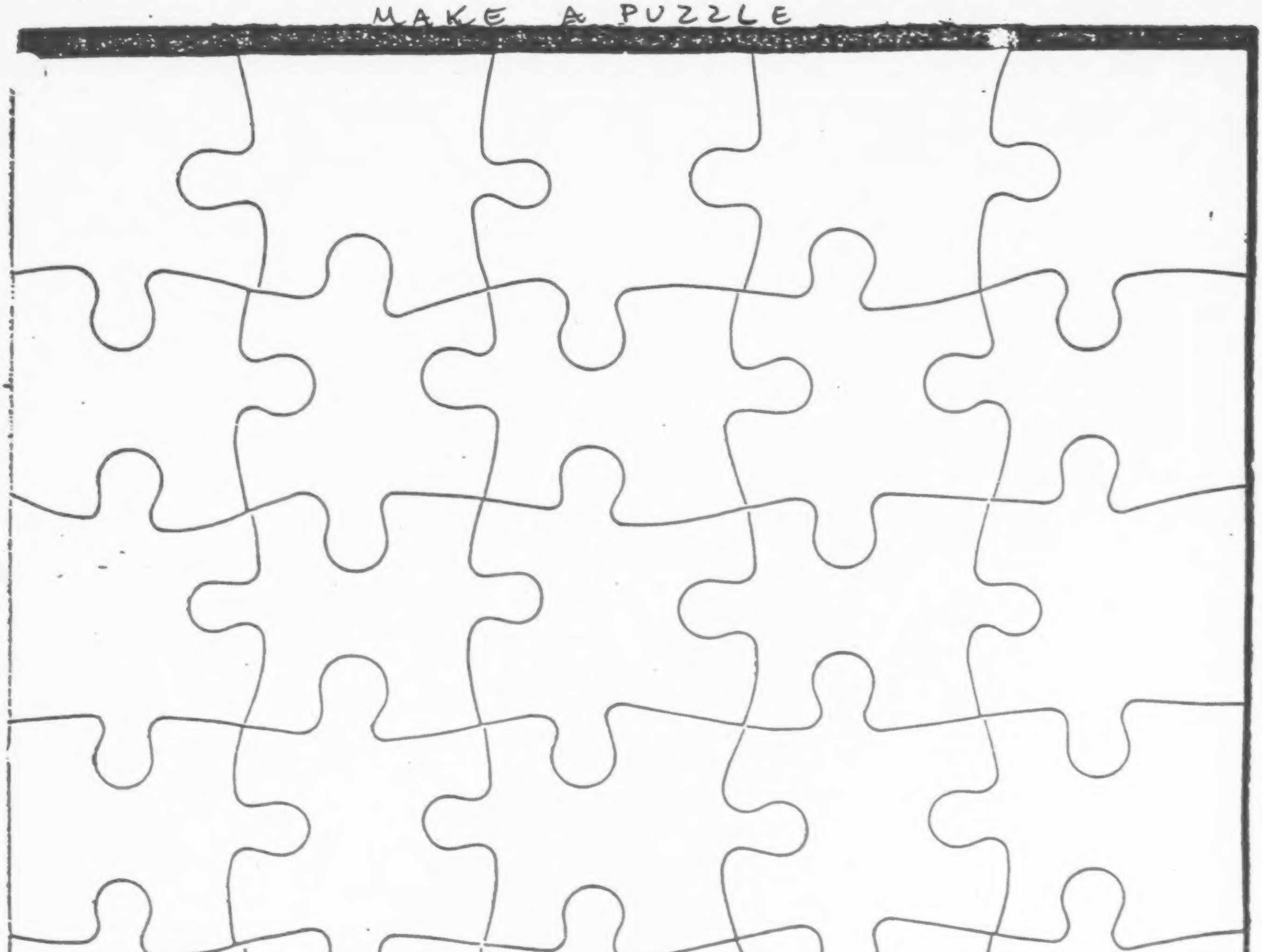
____

Who left the smudge on the candy machine?

____

Tape your clue strip and your 3 test strips to the reverse side of this lab.

MAKE A PUZZLE



Session 11

EXPRESSING NEW CONCEPTS AND RELATIONSHIPS

Purpose

- Identify connections between mathematics, science, language and literacy and utilize these connections in classroom activities.

LANGUAGE

Objectives

- Identify ways that concrete materials encourage students to develop receptive and expressive literacy skills
- Incorporate new vocabulary and language structures with familiar materials

Materials

- Copies of local newspapers for each participant
- "Newspaper Activities for Mathematics" and "Newspaper Activities for Science" **(S11/L1)** handout
- Use with Video Segment #4.

Introduction

- Discuss the potential of various sections of the newspaper to provide instruction in mathematics and science. The content provided in articles and advertisements can stimulate higher level cognitive activities while providing a meaningful context, often with a combination of text and graphics or illustrations. For some students this type of activity may be a challenging bridge between hands-on manipulative activities and those activities that often require comprehension of text with reduced context.

Activities

- Have students work in groups of 2-3 members to maximize verbal interactions. Ask one group to select the first of the recommended activities on the mathematics page. Allow about ten minutes, then ask for responses to the assigned task. Note how group responses may differ depending on which section of the paper and which day was used. Ask participants to reflect on the thinking and language/literacy skills used to complete the task. Have a group select one of the science activities, and follow the same process.
- Continue with several other activities as time allows.

- Ask participants to discuss what concepts ESOL students could learn or practice using this material and how could it be used as a springboard to other types of activities, especially those involving research and literacy skills.

MATHEMATICS

Objective

- Develop complex concepts through the use of manipulatives and verbal interaction.

Materials

- Transparency with equations organized by increasing levels of difficulty
- Balance and different symbols representing either literal or numerical coefficients

Introduction

- Discuss evolving nature of mathematics and the difficulty across cultures of understanding reasoning based on symbols with unfamiliar labels.[16]

Activities

- Discuss important mathematicians, their nationalities/societies/cultures, and their most important contributions. Talk about how have these ideas have affected our current system of understanding mathematical concepts and processes.
- Discuss findings about how memory operates within an information processing model of the mind.
- Solve several equations using the balance as a tool for connecting concrete and abstract reasoning stressing each sub-concept of the process, and the way it makes the solution understandable and memorable.

SCIENCE

Objective

- Increase scientific literacy through problem-solving and experimentation

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[16] Two good sources of information and ideas on multicultural activities would be: Boyer, C.B. (1985). A History of Mathematics. Princeton University Press. and Krause, M.C.(1993) Multicultural mathematics materials. Reston, Virginia: National Council of Teachers of Mathematics.

Materials

- 3 clean gallon milk containers
- Water
- Food coloring
- Small cups
- Answer key
- Transparencies
- Droppers
- Index cards
- Rulers
- Scissors
- "Chemical Detective Lab: Identifying Unknown Colors" **(S11/1)** handout

Introduction

- Read the following quote:

> Science teachers spend a lot of time teaching science skills and content, but far less time finding out if their students are able to apply this knowledge to solving science problems. Part of the problem is that the classic scientific method of problem solving gives the impression that science problems are solved in linear fashion by completing a series of steps, and after the last step the answer falls out. The scientific method is important, but science problems are rarely solved using precisely the ordered steps of the classic scientific method. Science problem solving is complex, messy, often disorderly, and applicable ideas and processes vary with almost every problem.[17]

- Ask for general responses, then focus on whether a problem solving approach would benefit or hinder ESOL students. Lead participants to verbalize the benefits for both language acquisition and overall scientific literacy for all students. Discussion may also raise the points that problem solving need not involve complex terminology, that students are strongly encouraged to communicate their ideas to others on their team, and that communication in this context is nonthreatening.

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[17] McIntosh, T.C. (1995). Problem- solving processes. The Science Teacher, 62(4), 16-19.

Activities

Chemical Detective Lab:

- The chemical detective lab will require some advance preparation. The prep work is described on the "Chemical Detective Lab: Identifying Unknown Colors" **(S11/1)** handout.
- Put participants in pairs. Use four unknowns. Each team should identify two unknowns. As they do, participants should report their data.
- For discussion, begin with the first unknown. Examine the data from every group. See if some groups can identify errors prior to giving the "known" answer. Reveal the answer. Repeat for each of the other three unknowns.
- As a wrap-up of this activity, discuss the value of repeated trials, large data samples, and independent groups working on a common problem.

Making a Big Chain:

- Give each team of three participants a 3x5 index card, a ruler, and a pair of scissors. Tell each team their task is to cut a hole in the index card in such a way that a person in the group can slip through it. The ring formed by the card must be continuous; two ends may not be joined together by tape, glue, or any other way.
- As time permits, give them time to brainstorm and try to solve the problem. (It is not important that any group is successful, but rather that the task is a vehicle for verbal interaction and planning).
- Reveal the solution. If time permits, allow them to complete the task. Otherwise show them a card that has been cut in advance.

- SOLUTION: Fold the index card in half along the long axis. With the fold on the bottom, begin measuring along the top edge. Make a mark at every half-centimeter from the left side. At each mark, draw a vertical line down to one-half centimeter from the fold. Cut along each line. Turn the card so that the fold is at the bottom. Beginning on the left end, cut a vertical line upward between the first two cut lines from the top. Do not cut all the way; stop about one-half centimeter from the top edge. Repeat this for every two cuts along the top edge. It will give a zig-zag appearance. Open the card so that the fold stays in the middle. Except for the two end pieces, cut along the fold in the middle of the card. By carefully spreading apart the cut portions, a single large ring should result.

- Have participants break into grade level groups of K-2, 3-5, 6 -8, and 9-12. Ask each group to make up a problem solving activity (or share a successfully-used one) that is appropriate for the students they teach. As time permits, allow groups to share their activity with one another.

CLOSURE

As an extension of the **CLOSURE** activity for **Session 10**, have the same groups list new contexts in which they might now use manipulatives to highlight the connections among science, mathematics, language, and literacy, especially for ESOL students.

Ruth Hough
Georgia State University

NEWSPAPER ACTIVITIES FOR MATHEMATICS & SCIENCE

Mathematics

1. Ask students to cut out photos, drawings, or ads that represent sets of 1, 2, 3, and so on through 10. Glue sets onto construction or poster paper and label them. If necessary, they can use native language to identify sets; teachers can help with English labels. Completed number sets can be saved for future exercises.

2. To help students learn to compare sizes, ask them to identify largest and smallest (or tallest/shortest) items in a photo or drawing. In groups, students record names of items and write sentences describing each one.

3. To learn English names for geometric shapes, students in groups cut out logos, and group them according to shapes they most closely resemble (e.g., Mercedes logo = circle, Delta Airlines logo = triangle).

4. Review car ads in the classified section to find the most/least expensive car listed that day, cars that cost between $1000 and $1500, etc. Arrange in categories, with discussion in L1 as needed, but presentation to the class in English.

5. From clothing ads, calculate full cost of one entire outfit they might wear. Add applicable sales tax. Recalculate with a 10 or 20 percent discount. Write name and price of each item; if language proficiency permits, write out whole word problem.

6. From grocery ads, buy items for a class party. Create charts showing items, quantities, prices, totals, taxes. Or, assign groups to spend $50 on food for a family (of four) for one day. Calculate total cost and change. Extrapolate to cost for a week, month, or year.

7. Find job listings in the help-wanted section that include salaries. Compute weekly salary from a yearly figure and vice versa.

8. Choose a destination from the travel section. Locate on a map, calculate distance, divide advertised bus/plane fare to figure amount being charged per mile or kilometer.

9. Chart or graph weather data for 2-3 major cities. State similarities/differences.

Source: Olivares, R.A. (1993). Using the newspaper to teach ESL learners. Newark, DE: International Reading Association.

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NEWSPAPER ACTIVITIES FOR MATHEMATICS & SCIENCE

Science

1. Cut out pictures of household products. Place in first column with other columns that list five senses. Students check off senses that can be used to recognize product.

2. To develop classification skills, find objects that originated from living things, nonliving things, or a mixture of both. Use objects to create semantic map.

3. Find photos and drawings of machines and arrange them in categories that fit a classification scheme of their choice. Examples might be: function (transportation, entertainment, household use), type of power (gas, battery, electric), or location of use (indoors/outdoors, urban/rural areas). Label name of each machine, names and attributes of each class, and general description of the classification scheme.

4. Group pictures of living things (plants or animals) by class. Label each item and list attributes of each class. Or, label attributes (e.g. gills, beaks, fur, scales) of 2-3 types of animals.

5. Find items that have to do with staying in good health. Items might include healthy foods, medicines, exercise equipment, sports gear, people engaging in healthy activities, etc. Create concept maps that show connections between health and diet, exercise, etc. Explain to other groups.

6. Plan a balanced meal. Assign each group to a different type of meal: breakfast, lunch, dinner, picnic, classroom party, snack for a trip, etc. Extend to an entire week. Group foods by category.

7. Search for news items of some natural phenomenon that became a catastrophe for humans. Record facts about the phenomenon, effects on people, and attitudes of affected population.

8. Have groups study weather maps and charts. Report on weather patterns in different regions. Compare forecasts with actual weather patterns.

Source: Olivares, R.A. (1993). Using the newspaper to teach ESL learners. Newark, DE: International Reading Association.

CHEMICAL DETECTIVE LAB: IDENTIFYING UNKNOWN COLORS

Directions for the Teacher

S11/Sc1
95

1. Use three clean plastic gallon milk containers. Add blue food coloring to one; red to another; and yellow to another. Fill the containers with water. (The color of the water should not be too light or too dark -- if too light, add more coloring; if too dark, dilute with water.) These are your STOCK solutions.

2. Label cups for your "unknowns". Choose as many as you desire. I make enough for each group to have 2 unknowns. Labels could be like "Unknown #1" or "Unknown A." (Make at least one extra labelled cup for each unknown to keep in reserve in case students spill a cup.)

3. Make up a key before you begin.
   Example: Unknown #1 3 Red : 5 Blue : 4 Yellow
   Unknown #2 4 Red : 0 Blue : 8 Yellow
   Unknown #3 7 Red : 5 Blue : 0 Yellow
   Note that all parts add up to 12!! This is important. (For younger kids, you could make the total add up to 8 or 9.)

4. Carefully measure the Stock solutions according to your key. It does not matter what measure you use as long as you measure carefully. (If you have a graduated cylinder, measure 30 mL red, 50 mL blue and 40 mL yellow for Unknown #1 above.) Make enough for more than each labelled Unknown cup. Fill the labelled Unknown cups (Step 2) about half-full. Save the rest in case students spill their samples.

5. Give each group a copy of the Data Sheet, a cup of Unknown, three cups of Knowns (Stock solutions, red, blue and yellow), a dropper for each Known cup, a clear transparency and a Mixing Guide to put under the transparency, and a paper towel to wipe off the transparency after the Unknown has been solved.

6. Demonstrate to students how to go about finding out what each unknown is made up. Explain that the total drops of red, blue and yellow must be 12 (or whatever number you decided). Be patient! Help each group get started. Once students "catch on", the lab will run itself.

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CHEMICAL DETECTIVE LAB: IDENTIFYING UNKNOWN COLORS

S11/Sc1
96

	Number of Drops			
UNKNOWN	RED	BLUE	YELLOW	RESULTING COLOR

Trial #	○	○	○	○	○
Trial #3	○	○	○	○	○
Trial #2	○	○	○	○	○
Trial #	○	○	○	○	○
Sample of the Unknown	○	○	○	○	○

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Session 12

SHARING INSTRUCTIONAL ADAPTATIONS AND PLANNING STRATEGIES

Purpose

- Share applications of course concepts in classroom instruction

Activities

- Participants must show how the course impacted their instruction with ESOL students. This may be done by sharing sample lesson or unit plans, audio or video tapes of mathematics or science instruction, oral reports, samples of student work, or some combination of these formats.[18]
- Both "success stories" and reports of new teaching challenges should be welcomed as stimulus for discussion.
- Final course evaluations - "Final Survey" **(S12)** - and paperwork related to SDU credit should also be completed.

Closure

Have participants plan a way to share their new instructional concepts with other teachers in their school.

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[18] The *Video and Video Guide* include samples of lessons some participants designed and taught. All the lesson plans created by the participants over the three-year period were also compiled as *Model Lesson Plans*. Both sets of materials are available at the Bilingual/Minority Education Office of the Georgia State Department of Education.

THE ACADEMIC LANGUAGE & LITERACY TRAINING PROJECT
FINAL SURVEY

GRADE/SUBJECT YOU TEACH NOW ____________________

NUMBER OF LEP STUDENTS YOU TEACH NOW ____________________

NUMBER OF YEARS YOU HAVE TAUGHT LEP STUDENTS ____________________

I. Course activities were organized in the following areas. Rate each area from 1 (low) to 5 (high) to show the degree to which ideas presented were new and useful to you as a teacher of mathematics and science, particularly to English learners.

New	Useful	
_____	_____	1. Increasing meaningful input
_____	_____	2. Experientially-based activities
_____	_____	3. Linking oral/written language to mathematics & science
_____	_____	4. Problem-solving & experimentation
_____	_____	5. Assessing student progress

II. Describe how you plan to share the knowledge gained from this course with others in your school or system.

III. List 4-5 ideas or activities from this course that have worked well for you in your own classroom, or that you intend to use during this academic year. Describe how your students have responded to these activities.

1.

2.

3.

4.

5.

IV. Based on your experience in this course, what recommendations would you make for future staff development for teachers who work with LEP students?

V. Distance Learning Segments

Please respond to each of the following statements with a number from 1 (strongly disagree) to 5 (strongly agree).

____ 1. I learned a lot from these sessions.

____ 2. I participated actively in these sessions.

____ 3. I got the attention I needed from instructors.

____ 4. I will consider using the distance learning format myself.

5. I would take a course using a distance learning format or recommend one to a friend:

____ a. if a similar course was offered in my school system with in-person instructors.

____ b. if instructors I wanted were available only on the distance learning format.

____ c. if no similar course was offered in my school system with in-person instructors for at least one year.

____ d. if the nearest similar course with in-person instructors required travel to downtown Atlanta.

____ e. if the nearest similar course with in-person instructors required travel of more than 25 miles to another school system.

6. The things I liked most about distance learning were:

7. The things I liked least about distance learning were:

8. Modifications I would recommend to make distance learning more effective:

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Appendix A

Project Publications

Conference Presentations

Hough, R.A. "Scaffolds for success: Supporting language-sensitive instruction." Paper presented to the International TESOL Conference, Baltimore, MD, March, 1994.

Hough, R.A. "ESOL mathematics and science instruction: Integrating content and language." Paper presented to the International TESOL Conference, Long Beach, CA, March, 1995.

Hough, R.A., Darzi, P., Retish, E., Serna, I., & Thompson, E. "Using multi-ethnic literature in bilingual and ESL classrooms. Demonstration presented to the International TESOL Conference, Long Beach, CA, March, 1995.

Hough, R.A. "Managing learning centers for K-8 ESOL summer programs." Workshop presented to the Georgia Migrant Education Summer Program Training, Macon, May, 1995.

Hough, R.A. "Language, language everywhere." Workshop presented to the Georgia Association for Young Children Annual Conference, Atlanta, October, 1995.

Hough, R.A. "Making connections: Language in mathematics and science instruction Demonstration presented to the International TESOL Conference, Chicago, March, 1996.

Hough, R.A. "Scaffolding academic literacy: An examination of inservice for teachers of linguistically diverse students." Paper accepted for presentation to the National Reading Conference Annual Meeting, Charleston, SC, December, 1996.

Hough, R.A. "ESOL mathematics and science." Demonstration accepted for presentation to the International TESOL Conference, Orlando, FL, March, 1997.

Reports

Hough, R.A., McCreery, A., Nurss, J.R., Blankenship, E., Vernon, D.W., Nations, M.J., Holberg, D., & Eckard, J. (1996). The Academic Language and Literacy Training Project. Mathematics & Science for English Learners: Curriculum. Atlanta, GA: Center for the Study of Adult Literacy, Georgia State University. (ERIC Document Reproduction Service No. tba)

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Hough, R.A. (1994). The Academic Language & Literacy Training Project. Mathematics & Science for English Learners: Year One Report: Atlanta, GA: Center for the Study of Adult Literacy, Georgia State University.

Hough, R.A. (1995). The Academic Language & Literacy Training Project. Mathematics & Science for English Learners: Year Two Report: Atlanta, GA: Center for the Study of Adult Literacy, Georgia State University.

Hough, R.A. (1996). The Academic Language & Literacy Training Project. Mathematics & Science for English Learners: Year Three Report: Atlanta, GA: Center for the Study of Adult Literacy, Georgia State University.

Articles

Hough, R.A. Teaching young English learners in classroom settings. Manuscript in preparation.

Hough, R.A. Celebrating diversity: Using multicultural books in content area studies. Manuscript in preparation.

Hough, R.A. Language-sensitive content instruction for English learners. Manuscript in preparation.

Appendix B

ALLT - Site Facilitator's Role

1. Requirements:

The site facilitator should:

- feel comfortable dealing with adults as an authority figure when necessary;
- have prior knowledge of technology involved or must be interested in learning about it;
- be flexible;
- have knowledge of subject area(s); though helpful, this is not necessary.

2. Job description:

The site facilitator should:

A) At the beginning of the course:

- know SDU rules for the different school systems involved (e.g., Is there tolerance for missed sessions? How must participation be documented? Can work be "made up"? Is there remuneration for attendance, if so, how much and how?);
- be familiar with the course's outline and overall requirements;
- be able to transmit and receive images and sounds using distance learning equipment;
- have the fax and phone numbers of all the sites involved including his/her own.

B) Before each session:

- arrive at site 30 minutes prior to the beginning of the session and test the connections with the other sites;
- check fax machine and phone line to ensure alternative ways of contacting the other sites;
- be familiar with the lesson plans for the day and know the sequence of activities;
- where applicable, arrange desks according to the number of participants and accessibility to microphones and cameras;
- organize and display the material and all handouts necessary for the lesson so as to facilitate both access to them and their distribution when the instructor so requests;
- be available to interact with the other sites whenever contacted.

C) During each session:

- take attendance: to avoid later disputes on actual amount of time of attendance, pass the sign-up sheet at a predetermined time, perhaps at the beginning and at the end of each session;
- during instruction, encourage class participants to interpret different activities in their own ways bringing them back to focus when necessary;
- encourage all participants to contact the instructors when they fail to do so on their own;
- collect all materials from participants as listed on the day's plan.

D) At the end of each session:

- close the session after dismissal from GSAMS hook-up by summarizing the main points of the day as well as reminding participants of the requisites for the following session;
- have participants fill out evaluation forms for the session;
- leave the room as it was prior to the session;
- arrange for remittance and reception of all materials necessary for the following session as established by the instructor.

E) At the end of the course:

- ensure that all forms documenting attendance are turned in to the due person(s);
- collect all assignments as well as all materials that the participants may have borrowed;
- administer the final evaluation;
- write a brief report that should include general comments, suggestions, and recommendations.